DOCUMENT RESUME

ED 218 422 CE 031 212

AUTHOR Bacon, E. Miles
TITLE Engine Tune-Up Service. Unit 3: Primary Circuit. Review Exercise Book. Automotive Mechanics Curriculum.
INSTITUTION Florida State Univ., Tallahassee. Career Education Center.
SPONS AGENCY Florida State Dept. of Education, Tallahassee. Div. of Vocational Education.
PUB DATE Aug 78
NOTE 123p.; For related documents see CE 031 208-222 and CE 033 108-109.

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS *Auto Mechanics; Check Lists; *Electric Circuits; *Engines; Evaluation Criteria; Postsecondary Education; Pretests Posttests; Review (Reexamination); Secondary Education; Study Guides; *Trade and Industrial Education
IDENTIFIERS *Automotive Tune Up; *Ignition Systems; Primary Ignition Circuit

ABSTRACT

This book of pretests and review exercises is designed to accompany the Engine Tune-Up Service Student Guide for Unit 3, Primary Circuit, available separately as CE 031 211. Focus of the exercises and pretests is testing the primary ignition circuit. Pretests and performance checklists are provided for each of the eight performance objectives contained in the unit. There are 31 review exercises that are short check-ups to let the student know how well she/he has learned the material for one or more work activities covered in the Student Guide. Answers to all of the exercises are found at the back of the book. (YLB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED218422

ENGINE TUNE-UP SERVICE

Unit 3: Primary Circuit

Review Exercise Book

Automotive Mechanics Curriculum

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

David McQuat

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

CE 031 212

State of Florida
DEPARTMENT OF EDUCATION
Ralph D. Turlington, Commissioner of Education
Tallahassee, Florida

An equal opportunity employer • *Division of Vocational Education* • August, 1978

Instructional Development: E. Miles Bacon
Content Review: Ludy Goodson, Theodore R. May, Roger L. Richardson
Editing: Melissa Wheeler
Graphic Design: John S. Matlock
Copyright: Marsha T. Paddock
Published by: Career Education Center, Florida State University

HOW TO USE THIS BOOK

In this Review Exercise Book, you'll find pretests and review exercises. These tests and exercises cover the material in the Student Guide. The Student Guide will tell you when to do a review exercise, so don't start doing any of these exercises yet.

PRETESTS

You will take the pretest for Performance Objective 8 before you start working through the Student Guide. A pretest is a test designed to help you and your instructor find out what you already know. The questions on the pretest may also be used to help you review what you've learned after studying the material and doing the activities.

REVIEW EXERCISES

A review exercise is a short checkup that lets you know how well you've learned the material for one or more work activities covered in the Student Guide. It is a way of testing yourself. The back of this book contains the answers to all the exercises.

You might be tempted to turn to the answers before you complete the questions, but if you do, you'll be the loser—for two reasons. In the first place, automotive mechanics is a skilled and dangerous trade. You need to know what you're doing and how to do it safely without having to check the book on every step. If you don't learn the material well, you can hurt yourself or damage the vehicle. In the second place, you'll eventually be graded by your instructor on how well you can do a performance objective. So if you look at the answers first, you'll just be wasting your time.

After you answer all the questions in a review exercise, check your answers against the ones in the back of the book. Review the material in the Student Guide for any question you have trouble with. Talk with your instructor if you're still unsure about any of the material covered in the Student Guide.

FINAL TESTS

These are the only two tests on which you will be graded. One of the tests is a written test, and the other one is a performance test. If you have studied the material in the Student Guide, and if you have done the exercises and work activities as required, you will have no trouble doing well on these final tests. You may even find them easy and fun to complete.

Now turn to the next page and complete the pretest for Performance Objective 8.

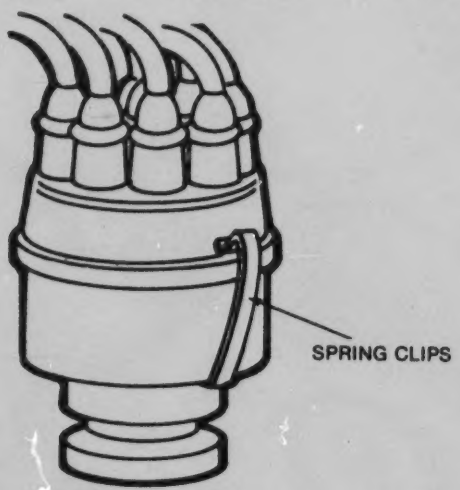
PRETEST—P.O. 8

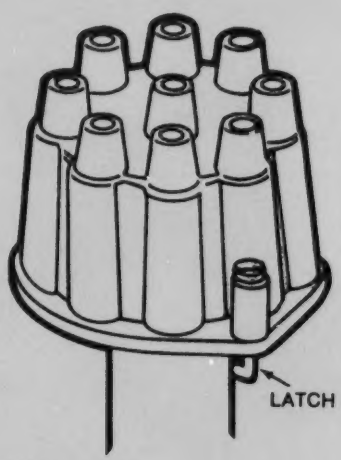
NAME _____

1. Check all the safety practices listed below that you should follow.

_____ a. Avoid touching the condenser or its lead during testing procedures.
_____ b. Turn on the ignition before hooking up a remote starter switch.
_____ c. Do not wear jewelry or loose clothing.
_____ d. Use fender covers only when you are wearing a belt.
_____ e. Follow the equipment manufacturer's instructions when using test equipment.
_____ f. Wipe off the distributor cap and housing after removing the cap.
_____ g. Make electrical tests only in dry areas.

2.





What tool would you use to remove this distributor cap?

_____ a. hose clamp pliers
_____ b. screwdriver
_____ c. ignition wrench
_____ d. your fingers
_____ e. needle-nose pliers

What tool would you use to remove this distributor cap?

_____ a. hose clamp pliers
_____ b. screwdriver
_____ c. ignition wrench
_____ d. your fingers
_____ e. needle-nose pliers

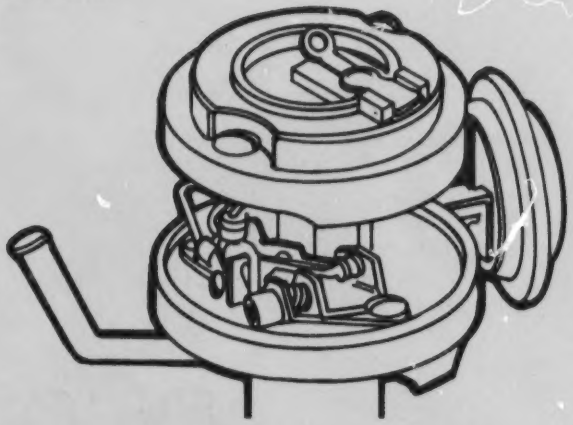
3. To remove the distributor cap after releasing it, you should:

_____ a. turn the cap 1/4-turn clockwise and lift
_____ b. turn the cap 1/4-turn counterclockwise and lift
_____ c. pull the cap off towards the rear of the engine
_____ d. lift the cap straight up
_____ e. do none of the above

4. If the RFI shield is left out of the distributor, which of the following will result:

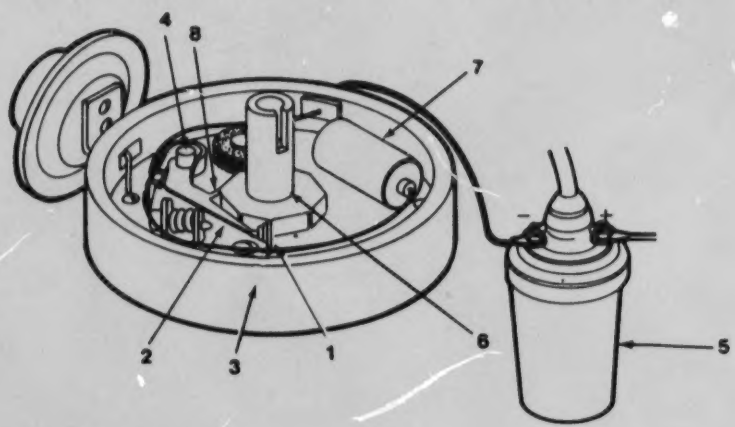
_____ a. improved high-speed performance
_____ b. fewer condenser failures
_____ c. increased radio static
_____ d. no change
_____ e. increased vehicle emission problems

5. How is this rotor removed?



_____ a. by removing the two screws on its mounting
_____ b. by turning it 1/2 turn in either direction, and lifting it
_____ c. by removing an allen nut
_____ d. by lifting it up and wiggling it from side to side
_____ e. by removing the RFI shield

6. Match the numbers below with the letters to the right to identify the parts in the diagram.



_____ 1
_____ 2
_____ 3
_____ 4
_____ 5
_____ 6
_____ 7
_____ 8

a. stationary point
b. condenser
c. distributor cam
d. point rubbing block
e. movable point
f. breaker plate assembly
g. point pivot post
h. coil
i. distributor

6

7. Which of the following is *not* one of the common types of breaker points?

_____ a. uni-set
_____ b. reluctor and pickup set
_____ c. single contact point assembly
_____ d. dual points

8. The function of contact points is to:

_____ a. open and close the primary ignition circuit
_____ b. only close the primary ignition circuit
_____ c. open and close the secondary ignition circuit
_____ d. only close the secondary ignition circuit

9. Which of the following conditions would *not* result in blue or black points?

_____ a. a defective condenser
_____ b. oil on the contact points
_____ c. excessive arcing
_____ d. a high charging rate
_____ e. a wide point gap

10. Contact points should be replaced when pitting exceeds:

_____ a. 0.002 inch
_____ b. 0.010 inch
_____ c. 0.020 inch
_____ d. 0.100 inch
_____ e. 0.200 inch

11. Which of the following would cause a late spark from the coil to the spark plugs?

_____ a. point gap too wide
_____ b. point gap too narrow

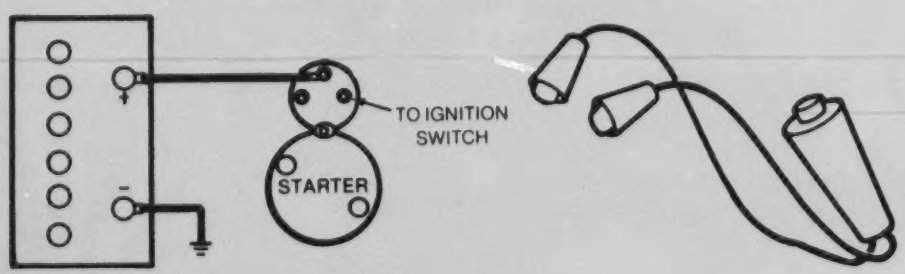
12. Which of the following conditions would *not* prevent a car from starting?

_____ a. a worn rubbing block
_____ b. pitting of 0.010 inch
_____ c. burned points
_____ d. a condenser with excess capacity

13. How should you disable the ignition when making primary circuit tests?

_____ a. Remove and tape the positive lead to the coil.
_____ b. Remove and ground the center high-tension wire from the distributor cap.

14. Draw the correct hookup for the remote starter switch shown below.



15. Contact point resistance can be measured by using:

_____ a. a voltmeter
_____ b. an ammeter
_____ c. a tachometer
_____ d. a dwell meter

16. The maximum voltage drop for a contact point resistance test is:

_____ a. 0.05 volt
_____ b. 0.25 volt
_____ c. 0.50 volt
_____ d. 2.50 volts
_____ e. 5.00 volts

17. The contact point adjustment should be tested when:

_____ a. the engine is being cranked
_____ b. the rubbing block is not touching the distributor cam
_____ c. the points are fully closed
_____ d. the rubbing block is on the tip of a distributor cam lobe

18. Which one of the following conditions prevents accurately measuring the point gap with a feeler gauge?

_____ a. pitting of the contact points
_____ b. a worn rubbing block
_____ c. a worn distributor cam
_____ d. gray contact points

19. Point alignment is checked by:

_____ a. making a dwell measurement
_____ b. using a spring tension gauge
_____ c. making a visual inspection
_____ d. using a feeler gauge

20. Too little contact point spring tension can result in:

_____ a. a worn distributor cam
_____ b. poor engine performance
_____ c. point bounce
_____ d. excessive wear of the rubbing block

21. Check all correct answers. The condenser:

_____ a. absorbs excess current flow when the points open
_____ b. discharges to ground when the points close
_____ c. must be matched to the requirements of the ignition system
_____ d. can hold excess current for only a fraction of a second

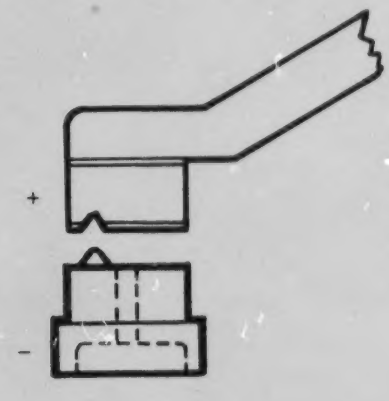
22. Which of the following conditions would ***not*** result in excessive condenser series resistance?

_____ a. a worn or frayed condenser lead
_____ b. excessive condenser capacity
_____ c. a loose condenser connection
_____ d. poor grounding of the condenser

23. A condenser leakage test can detect:

_____ a. poor grounding of a condenser
_____ b. poor storage of current by a condenser
_____ c. excessive condenser resistance
_____ d. loose or worn condenser leads

24. When replacing the condenser for the points shown below, you should choose:



_____ a. one with the same capacity
_____ b. one with a different capacity

25. The steps for making a condenser leakage test are listed out of order below. Put the letter of each step beside the proper number to show the correct sequence.

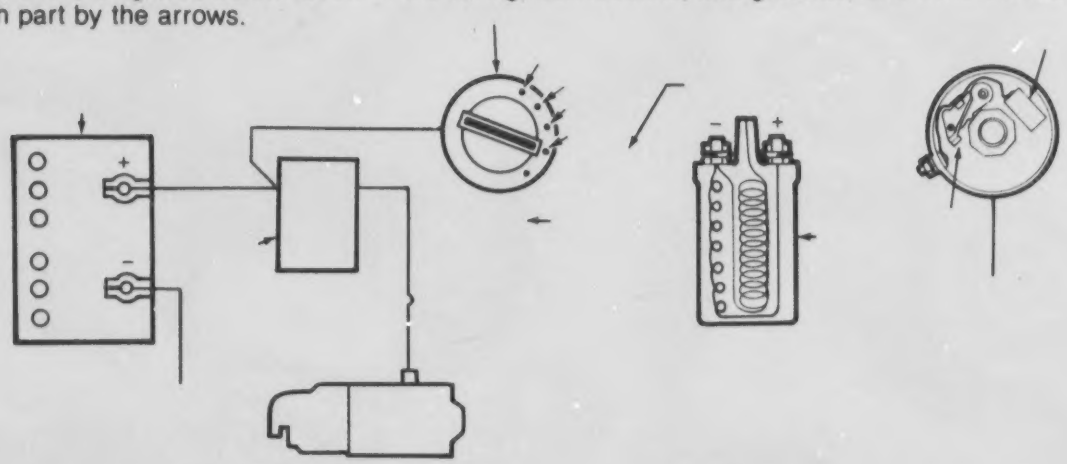
Order	Steps
_____ 1	a. Remove the rotor.
_____ 2	b. Crank the engine until the contact points are open.
_____ 3	c. Hook up the tester leads.
_____ 4	d. Disable the ignition system.
_____ 5	e. Remove the distributor cap.
_____ 6	f. Make a leakage test.
_____ 7	g. Calibrate and adjust the tester.
_____ 8	h. Remove the RFI shield.

When you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you to either practice the work activities or to study the material covered by this test.

EXERCISE 1

1. The vehicle ignition system is made up of two circuits: _____ and _____.
2. The purpose of an ignition system is to step up 12 volts to about _____ volts at the spark plugs.
3. Approximately 90 percent of all engine malfunctions are related to _____ problems.
4. The part of the ignition system that steps up voltage from low to high is called the _____.
5. The primary circuit carries _____ voltage current from the battery to the coil and then to the contact points in the distributor.
6. Beside each statement below, write a *T* if it is true, and an *F* if it is false.
   - _____ a. The battery is the source of current and voltage in the ignition system.
   - _____ b. One of the purposes of the ignition switch is to control the flow of current in the secondary circuit.
   - _____ c. The primary resistor controls the amount of current in the primary circuit while the engine is starting.
   - _____ d. The function of the bypass wire is to control the amount of current flowing while the engine is operating.
   - _____ e. The contact points control the ignition system by opening and closing the primary circuit.
   - _____ f. The distributor controls the timing of the spark.
   - _____ g. The condenser absorbs continuing current when the contact points open.

7. Look at the diagrams below. Draw in the wiring, connections, and grounds, and write the name of each part by the arrows.



8. The scope measurement of voltage at the spark plug gaps is given in _____.

Now turn to the back of this book and check your answers for Exercise 1.

EXERCISE 2

1. Why should you wipe off any dirt around the distributor cap before removing it?

   _____ a. You will be able to find the hold-down clips more easily.
   _____ b. You will keep dirt from getting inside the distributor.
   _____ c. You will be able to see the rotor.
   _____ d. You will keep your hands clean while working around the distributor.

2. The procedures for removing a latch-type distributor cap are:

   a. Using a _____, press the latch down. Then turn the latch _____ turn. (Do the same to the other latch.)

   b. Push up on the _____ to disconnect it from the distributor.

   c. Lift the distributor cap straight up and away to avoid damage to the _____.

3. The distributor rotor is sometimes removed in order to see the _____ _____ better.

4. Some rotors are removed by simply working the rotor _____ and _____ the distributor shaft.

5. To install some rotors, it is necessary to align the inside _____ of the rotor to the _____ on the distributor shaft, and then _____ it downward to be sure it locks squarely in place.

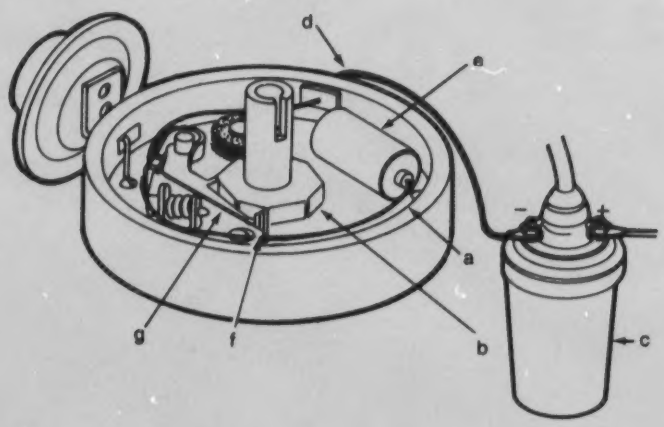
6. Some distributors are equipped with RFI shields. RFI means _____ _____ _____.

7. The RFI shield should not be thrown away when a _____ contact points set is used in the distributor.

Now turn to the back of this book and check your answers for Exercise 2.

EXERCISE 3

1. Identify the lettered distributor and ignition parts.



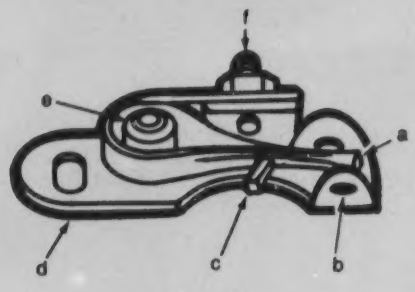
a. _____ e. _____

b. _____ f. _____

c. _____ g. _____

d. _____

2. Identify the lettered contact point parts.



a. _____ d. _____

b. _____ e. _____

c. _____ f. _____

3. Complete the steps below that show how contact points operate like a switch.
   a. The _____ _____ of the movable point (arm) closes the points.
   b. When the points are _____, electric _____ _____ passes through them.
   c. Then, as the distributor _____ rotates, it pushes against the _____ _____ of the movable point and opens it.
   d. Finally, when the movable point opens, the flow of electric _____ stops.

For Questions 4-6, write ***yes*** or ***no*** in the blanks.

4. _____ The uni-set contact points set can be adjusted from outside the distributor.
5. _____ The uni-set includes the condenser as well as the contact points.
6. _____ ***Dual points*** means that two sets of points are installed in a distributor.
7. The color of burned contact points is:
   _____ a. blue or black
   _____ b. gray
   _____ c. white
8. The color of normal contact points is:
   _____ a. blue
   _____ b. white or light gray
   _____ c. black
   _____ d. purple
9. Check all correct answers. Burned contact points are caused by:
   _____ a. too much arcing at the points
   _____ b. a high charging rate
   _____ c. incorrect contact point adjustment
   _____ d. oil or grease on the points
10. Pitted contact points are caused by:
   _____ a. the wrong condenser
   _____ b. a narrow contact point gap
   _____ c. a wide contact point gap
   _____ d. a worn rubbing block
11. Too small a gap between the contact points leads to _____, _____, or _____ of the points.
12. Too wide a gap between the contact points causes the spark from the coil to be delivered _____ to the spark plugs.

13. Check all correct answers. Proper alignment of contact points will:

_____ a. extend the life of the points
_____ b. reduce wear
_____ c. reduce heat
_____ d. reduce arcing
_____ e. reduce pitting

14. Check all correct answers. Which contact point defects cause an engine to miss?

_____ a. points not adjusted correctly
_____ b. dirty points
_____ c. points having a poor ground
_____ d. points not opening

Now turn to the back of this book and check your answers for Exercise 3.

EXERCISE 4

1. The remote start switch allows you to _____ or _____ an engine from the engine compartment.

2. A contact point resistance test measures the amount of _____

   _____ through the contact points when they are closed.

3. Check all correct answers. Too much resistance or voltage drop indicates:

   _____ a. improperly installed points
   _____ b. burned points
   _____ c. misaligned points
   _____ d. loose distributor lead or ground wires

4. Point resistance is considered too high when the voltage drop reads more than:

   _____ a. .02 volt
   _____ b. .05 volt
   _____ c. .1 volt
   _____ d. .04 volt

5. The contact point gap is measured when the contact points are _____.

6. A heavy drag is felt when the correct feeler gauge is passed between the contact points. This means:

   _____ a. the points are too far apart
   _____ b. the points are too close together

7. The contact point gap adjustment is correct when the feeler gauge just _____ the contact points.

8. The wider the contact point gap, the _____ the time the points remain closed.

9. The smaller the contact point gap, the _____ the time the points remain closed.

10. To test the contact points for proper spring tension:

    a. place a small piece of paper between the points when the points are _____

    b. hook the spring tension gauge onto the _____ contact point

    c. gently pull on the tension gauge until _____

    d. note the reading on the _____ _____

       _____

Now turn to the back of this book and check your answers for Exercise 4.

EXERCISE 5

1. The condenser performs two basic functions in the ignition system.

   a. It _____ the continuing electric charge of cu ..t at the moment the contact points _____.

   b. It _____ the electric charge.

2. The condenser assembly is mounted on the distributor _____ _____ assembly.

3. The condenser lead is attached to the terminal on the _____ _____.

4. The condenser lead is also connected to the _____ _____ wire.

5. Check all correct answers. Defects that may develop in a condenser are:

   _____ a. a broken or frayed condenser lead
   _____ b. a loosely connected condenser lead
   _____ c. a loose condenser
   _____ d. poor capacity because contact points are badly pitted

6. A broken condenser lead or a lead causing a direct short in the electrical circuit will cause an engine to _____.

7. A loose condenser (poor ground) will cause an engine to _____.

8. A loose condenser terminal lead connection will cause an engine to _____.

9. Check all correct answers. Which of the following conditions are tested using a condenser tester?

   _____ a. series resistance
   _____ b. capacity
   _____ c. container size
   _____ d. leakage

10. To hook up the condenser tester:

a. disconnect the _____ _____ from the coil

b. connect one condenser tester lead to the _____ _____

_____

c. connect the other condenser tester lead to the _____

_____

d. rotate the distributor cam until the contact points are _____

11. The condenser series resistance test measures the amount of resistance in the _____

_____ and _____ _____.

12. The condenser leakage test tells whether there is an _____ defect in the condenser.

13. The condenser capacity test tells whether the condenser is of the right _____

or _____ to absorb the continuing electric current.

Now turn to the back of this book and check your answers for Exercise 5.

PERFORMANCE CHECKLIST—P.O. 8

The instructor will provide either a live vehicle or a live engine. Inspect the points and condenser. All of the performances below must be accomplished.

Student Performances

1. Removed the distributor cap and rotor.
2. Visually inspected the contact points and noted any defects.
3. Tested the points for resistance and recorded the results.
4. Checked point gap adjustment and alignment and recorded the results.
5. Tested contact point spring tension, and recorded the results.
6. Visually inspected the condenser and lead.
7. Tested the condenser, and recorded the results.
8. Replaced the rotor and cap.
9. Used the proper tools and equipment.
10. Followed all appropriate safety precautions.
11. Performed tasks in an acceptable amount of time.

Instructor Ratings

Acceptable		Not Acceptable		Omit

Keep a copy of this checklist for your records.

19

PRETEST—P.O. 9

NAME _____

1. Check all of the safety practices listed below that you should follow.
   - _____ a. Look before reaching when working around an engine.
   - _____ b. Avoid making electrical tests when the floor or vehicle is wet.
   - _____ c. Connect the timing light leads only when the engine is off.
   - _____ d. Select only large tools when working with a distributor to prevent dropping them into the distributor.
   - _____ e. Keep long hair under a hat.
   - _____ f. Avoid wearing loose clothing or jewelry.
   - _____ g. Wipe off the distributor cap and housing after removing the cap.

2. The preferred method of removing and installing points and condenser is to:
   - _____ a. work with the distributor ***on*** the engine
   - _____ b. work with the distributor ***off*** the engine

3. The steps for removing the points and condenser are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	**Steps**
_____ 1	a. Slide out the contact set and remove it.
_____ 2	b. Loosen the attaching screws.
_____ 3	c. Remove the distributor cap and rotor.
_____ 4	d. Remove the RFI shield.
_____ 5	e. Remove the condenser.
_____ 6	f. Loosen the terminal lead screw or nut.
_____ 7	g. Remove the condenser retaining screw.
_____ 8	h. Stuff cloths into the breaker plate openings.

4. Check all correct statements.
   - _____ a. A special point-bending tool is used for making corrections in contact point alignment.
   - _____ b. Uni-set contact points should not be adjusted for alignment.
   - _____ c. Points must be aligned both laterally and centrally.
   - _____ d. Contact point alignment is performed when the points are fully open.
   - _____ e. Only the moving contact point is adjusted.

5. Proper contact point spring tension is usually:
   - _____ a. 7 - 12 ounces
   - _____ b. 12 - 17 ounces
   - _____ c. 17 - 21 ounces
   - _____ d. 21 - 27 ounces

6. Contact point spring tension is adjusted by:
   - _____ a. loosening the nut on the terminal post and sliding the moving arm
   - _____ b. loosening the nut on the terminal post and sliding the stationary arm

7. Look at the following diagram of contact points.

To decrease the spring tension pressure on the contact points, you would move the arm:

_____ a. to the left
_____ b. to the right

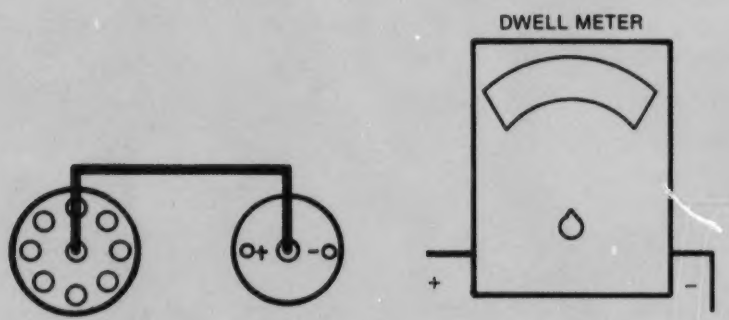
8. The point gap is adjusted with the rubbing block:

_____ a. resting on one of the distributor cam lobes
_____ b. resting on one of the distributor cam flat spots
_____ c. not touching the distributor cam

9. When the point gap is decreased:

_____ a. the ignition spark is advanced
_____ b. the points stay open longer
_____ c. the dwell meter registers a lower reading
_____ d. the amount of distributor cam dwell increases

10. Draw the correct hookup for using a dwell meter.



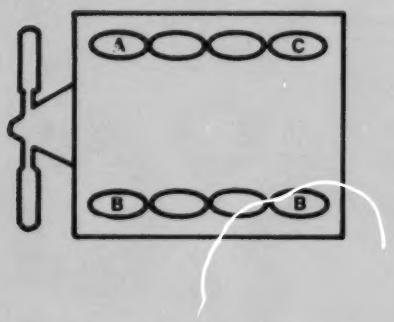
11. The steps for making a dwell reading are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1	a. Refer to the manufacturer's specifications for the correct dwell setting.
_____ 2	b. Crank the engine and read the dwell.
_____ 3	c. Disconnect the advance/retard solenoid.
_____ 4	d. Hook up the remote starter.
_____ 5	e. Set and calibrate the dwell meter.
_____ 6	f. Disable the ignition.
_____ 7	g. Connect the dwell meter leads.
_____ 8	h. Remove and plug the vacuum advance line.
_____ 9	i. Conduct the point resistance test.

12. Timing specifications are usually indicated as the number of degrees:

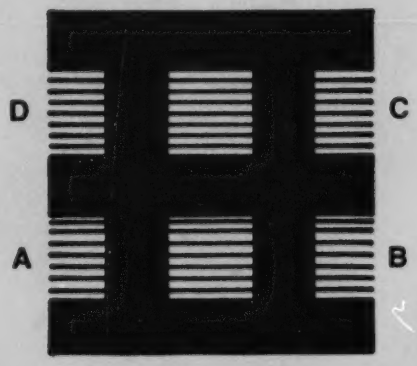
_____ a. TDC
_____ b. BBDC
_____ c. BTDC
_____ d. ATDC

13. Look at the diagrams below.



For this Chevrolet engine, which is the #1 cylinder?

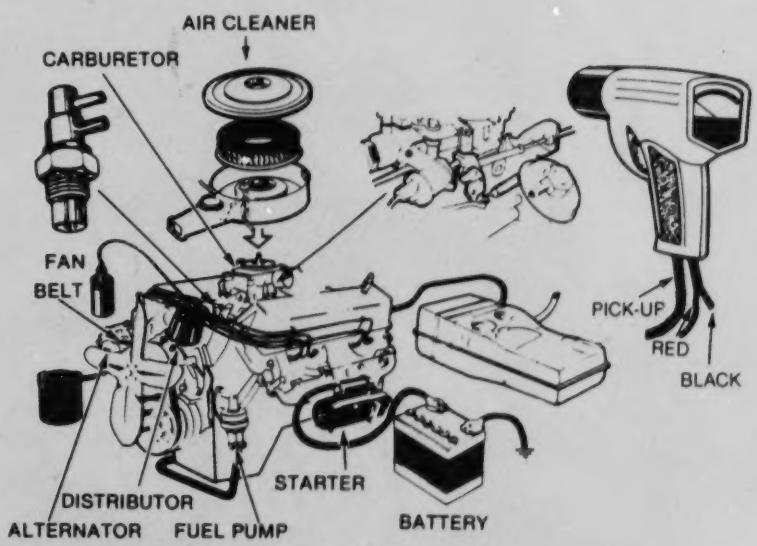
_____ a. A
_____ b. B
_____ c. C
_____ d. D



For this VW engine, which is the #1 cylinder?

_____ a. A
_____ b. B
_____ c. C
_____ d. D

14. Draw the proper hookup for a power timing light.



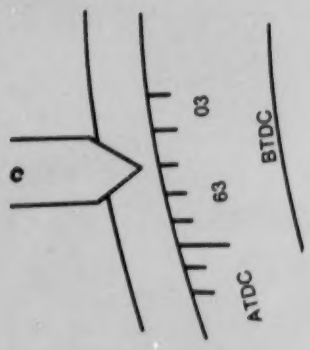
15. Which one of the following statements is true?

_____ a. Engine RPM does not affect ignition timing.
_____ b. Both point dwell and spark timing affect ignition timing.
_____ c. Only spark timing affects ignition timing.
_____ d. Only point dwell affects ignition timing.

16. The correct sequence for adjusting the idle speed is to:

_____ a. initially adjust idle mixture; then adjust idle speed; then adjust idle mixture as necessary
_____ b. initially adjust idle mixture; then adjust idle speed as necessary
_____ c. initially adjust idle speed; then adjust idle mixture; then adjust idle speed as necessary

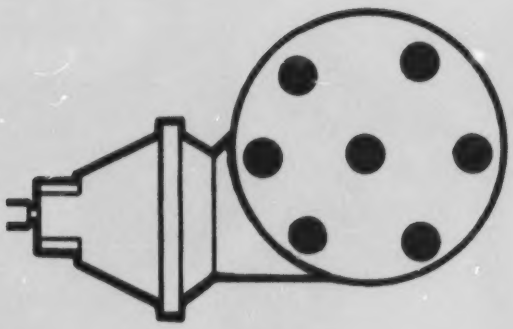
17. Look at the example of timing marks below.



If you saw this when using a timing light, which way would you turn the distributor body to adjust the timing to 3° BTDC?

_____ a. in the direction of the cam rotation
_____ b. in the direction opposite the cam rotation

18. Look at the diagram of a distributor below.



For this distributor, turning the body clockwise would:

_____ a. retard the spark
_____ b. advance the spark

19. Which of the following would *not* result in poor engine performance?

_____ a. ignition timing too advanced
_____ b. point dwell too great
_____ c. carburetor idle mixture too lean
_____ d. carburetor idle speed too high

20. The steps for timing an engine are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	**Steps**
_____ 1	a. Loosen the hold-down bolt and adjust the distributor body as necessary.
_____ 2	b. Adjust the engine idle speed.
_____ 3	c. Refer to the vehicle emissions control decal for proper specifications.
_____ 4	d. Detach all equipment.
_____ 5	e. Hook up the ignition timing light.
_____ 6	f. Hook up the tachometer.
_____ 7	g. Set the point dwell to specifications.
_____ 8	h. Tighten the distributor hold-down bolt.
_____ 9	i. Clean off the timing marks.
_____ 10	j. Note the timing of the engine.

When you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you to either practice the work activities or to study the material covered by this test.

EXERCISE 6

1. To remove a single contact point set, you should follow these general procedures:

   a. Remove the _____ cap and the _____.

   b. Stuff cloth into any openings in the _____

      _____ _____ assembly.

   c. Loosen the lead terminal screw and remove the _____

      and _____ leads.

   d. Loosen or remove the _____ point base screw(s) and lift the assembly from the distributor.

2. When installing a new set of contact points, you should first:

   a. _____ the distributor cam and the distributor breaker plate assembly.

   b. Then, apply a thin coating of _____ _____ around the distributor cam.

3. After installing a new set of contact points, you should follow these general procedures:

   a. Double-check the _____ lead and the _____ lead to be sure they are not touching any moving parts.

   b. Also, make sure they will not interfere with the normal movement of the _____

      _____ _____.

4. If lubricant gets on the points, the points will _____.

5. The condenser is always replaced when a _____ contact point is replaced.

Now turn to the back of this book and check your answers for Exercise 6.

EXERCISE 7

1. Check all correct answers. Misalignment of contact points causes them:
   - _____ a. to wear faster
   - _____ b. to overheat
   - _____ c. to make a bad electrical connection
   - _____ d. to pit
2. To correct the alignment of contact points:
   - _____ a. bend the movable contact point
   - _____ b. bend the movable arm
   - _____ c. bend the stationary contact point
   - _____ d. adjust the contact point gap
3. If the contact point alignment is incorrect on uni-set contact points, they should be _____.
4. The contact point alignment should be corrected when the contact points are _____.
5. The contact point spring tension is checked when the contact points are _____.
6. To decrease the spring tension on a set of contact points, slide the spring arm of the movable point _____ the contact point pivot post.
7. To increase the spring tension on a set of contact points, slide the spring arm of the movable point _____ the contact point pivot post.
8. The contact point gap is correct when the specified feeler gauge:
   - _____ a. drags between the contact points
   - _____ b. just touches the contact points
   - _____ c. passes easily between the contact points without touching
   - _____ d. moves the movable contact point away from the stationary point contact
9. The contact point gap is tested with a feeler gauge when the points are fully _____.
10. A wide point gap will have a _____ dwell meter reading.
11. A small point gap will have a _____ dwell meter reading.
12. The term *dwell* means: _____

13. Cam lobes are:

_____ a. the flat parts of the cam
_____ b. the high parts of the cam
_____ c. the rotation of the cam
_____ d. the diameter of the cam

14. Generally, to measure contact point adjustment using a dwell meter, you should do the following:

a. Connect the positive tester lead of the dwell meter to the _____

_____ terminal on the _____.

b. Connect the negative tester lead of the dwell meter to the _____

_____.

c. Set the dwell meter switch for a _____, _____,

or _____ cylinder engine.

d. Operate the engine and read the meter _____.

Compare the reading to the manufacturer's _____.

15. Generally, the tune-up specifications for dwell on a V-8 engine range from:

_____ a. 20° - 25°
_____ b. 10° - 15°
_____ c. 27° - 32°

16. Generally, tune-up specifications for dwell on a 6-cylinder engine range from:

_____ a. 28° - 30°
_____ b. 31° - 42°
_____ c. 45° - 48°

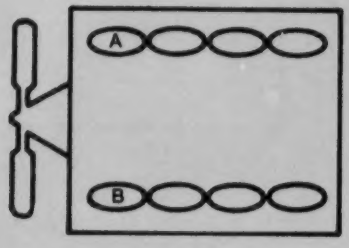
Now turn to the back of this book and check your answers for Exercise 7.

EXERCISE 8

1. Ignition timing refers to the time at which the #1 _____ _____ ignites the _____ when the #1 _____ is at _____ _____ _____ on its compression stroke.
2. TDC means _____ _____ _____.
3. The vehicle emission control information decal has _____ specifications for the mechanic. It is located in the _____.
4. A power timing light is designed to _____ at exactly the same instant the #1 spark plug fires.
5. A power timing light is used to adjust _____ _____.
6. The power timing light leads are attached to:
   a. _____
   b. _____
   c. _____
7. The contact point dwell should be adjusted _____ setting the ignition timing.
8. A tachometer measures engine _____.
9. To adjust the ignition timing, you should do the following:
   a. Look up the vehicle manufacturer's timing _____.
   b. Clean and mark the engine _____ _____.
   c. Disconnect and plug the distributor _____ lines as required.
   d. Hook up the _____ _____ leads to the _____ terminals and to the _____ spark plug.
   e. Start the engine and set the engine _____ _____ to manufacturer's specifications.
   f. Loosen the distributor _____ bolt.
   g. Aim the timing light at the timing marks and turn the _____ until the timing marks are aligned.
   h. Tighten the distributor _____ bolt.28

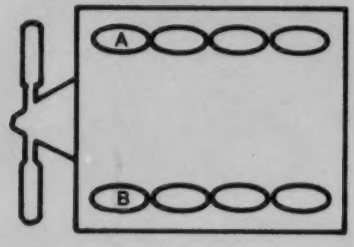
10. When you turn the distributor in the opposite direction of the rotation of the rotor, you are _____ the ignition timing.

11. Look at the diagram below. Where is the #1 spark plug located on this Chevrolet V-8 engine?



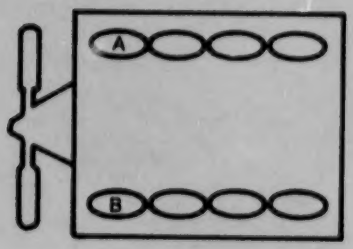
_____ a. at letter A
_____ b. at letter B

12. Look at the diagram below. Where is the #1 spark plug located on this Chrysler V-8 engine?



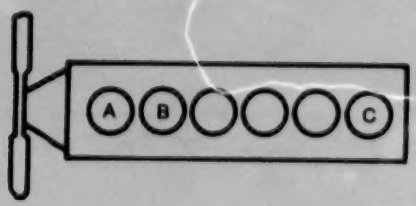
_____ a. at letter A
_____ b. at letter B

13. Look at the diagram below. Where is the #1 spark plug located on this Ford V-8 engine?



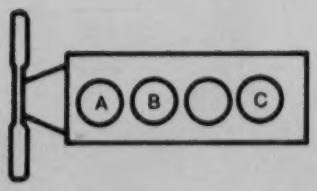
_____ a. at letter A
_____ b. at letter B

14. Look at the diagram below. Where is the #1 spark plug located on this 6-cylinder engine?



_____ a. at letter A
_____ b. at letter B
_____ c. at letter C

15. Look at the diagram below. Where is the #1 spark plug located on this 4-cylinder engine?



_____ a. at letter A
_____ b. at letter B
_____ c. at letter C

Now turn to the back of this book and check your answers for Exercise 8.

PERFORMANCE CHECKLIST—P.O. 9

The instructor will provide either a live vehicle or a live engine. Replace the points and condenser. All of the performances below must be accomplished.

Student Performances

1. Removed the distributor cap and rotor.
2. Removed the points and condenser.
3. Cleaned the breaker plate and lubricated the cam.
4. Installed the points and condenser.
5. Aligned the contact points.
6. Adjusted the contact point spring tension.
7. Set the initial point gap, using a feeler gauge.
8. Set the final point gap, using a dwell meter.
9. Replaced the cap and rotor.
10. Adjusted the engine idle.
11. Adjusted the ignition timing.
12. Used the proper tools and equipment.
13. Followed all appropriate safety precautions.
14. Performed tasks in an acceptable amount of time.

Instructor Ratings

Acceptable	Not Acceptable	Omit

Keep a copy of this checklist for your records.

PRETEST—P.O. 10

NAME _____

1. Check all the safety practices listed below that you should follow.

   _____ a. Do not wear a hat while working under the hood.
   _____ b. Avoid wearing jewelry or loose clothing when working around an operating engine.
   _____ c. Never make electrical tests while in or around wet areas.
   _____ d. Use fender covers only when you are wearing a belt.
   _____ e. Follow the test equipment manufacturer's procedures.
   _____ f. Route timing light leads away from the engine fan and pulleys.
   _____ g. Wipe the distributor cap clean before removing it.

2. Check all correct answers. When removing a distributor, you should crank the engine until:

   _____ a. the timing marks are aligned
   _____ b. the points are fully open
   _____ c. the points just start to close
   _____ d. the rotor is aligned with the #1 spark plug terminal
   _____ e. the compression stroke begins for the #1 cylinder
   _____ f. the power stroke ends for the #1 cylinder

3. Is it possible for the engine timing marks to be aligned without having the distributor rotor pointing towards the #1 spark plug terminal?

   _____ a. yes
   _____ b. no

4. The steps for removing a distributor are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1	a. Mark the #1 spark plug wire spot on the distributor cap and body.
_____ 2	b. Remove the advance/retard solenoid lead at the carburetor as necessary.
_____ 3	c. Crank the engine to align timing marks.
_____ 4	d. Remove the coil-to-distributor primary lead.
_____ 5	e. Clean the timing marks.
_____ 6	f. Remove the vacuum advance hose.
_____ 7	g. Attach the remote start switch.
_____ 8	h. Remove the distributor cap.

5. How should you identify hoses and wires for easy reassembly when removing a distributor?

   _____ a. with a file
   _____ b. with a hacksaw
   _____ c. with masking tape
   _____ d. with a punch

6. Which of the following special tools or equipment would you *not* use on a distributor?

_____ a. distributor puller
_____ b. paint or chalk
_____ c. distributor wrench
_____ d. antirust solvent
_____ e. ball peen hammer

7. The distributor should be stored:

_____ a. in a horizontal position
_____ b. in an upright position
_____ c. wrapped in plastic and set upside down

8. The steps for installing a distributor are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1	a. When the drive gear meshes in the block, the rotor will stop at the first mark made on the distributor body.
_____ 2	b. Turn the rotor to the last mark made on the distributor body.
_____ 3	c. Attach the distributor-to-coil primary wire.
_____ 4	d. Turn the distributor until the locating mark on the body aligns with the matching mark on the engine block.
_____ 5	e. Install the distributor gasket on the engine block.
_____ 6	f. Install the hold-down clamp and bolt; then, tighten the bolt.
_____ 7	g. Install the distributor on the engine block.

9. How should you correct the problem of a distributor that does not seat flush on the engine block?

_____ a. Rotate the distributor rotor while pressing it down lightly.
_____ b. Crank the engine once and try to install the distributor again.
_____ c. Tap lightly on the distributor body with a soft hammer.
_____ d. Do none of the above.

10. The steps for installing a distributor when no marks were made are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1	a. Install and tighten the hold-down bracket and bolt.
_____ 2	b. Position the rotor so that the final position will align with the #1 spark plug terminal.
_____ 3	c. Remove the #1 spark plug.
_____ 4	d. Install the distributor; then, make sure the rotor aligns with the #1 spark plug terminal.
_____ 5	e. Crank the engine to the end of the compression stroke for the #1 cylinder.
_____ 6	f. Turn the distributor body until the contact points just start to open.
_____ 7	g. Install the spark plug.
_____ 8	h. Crank the engine to align the timing marks.

When you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you to either practice the work activities or to study the material covered by this test.

EXERCISE 9

1. When the engine timing marks are aligned to the manufacturer's specifications, the distributor rotor should be pointing to the _____ spark plug wire before the distributor is removed.
2. It is important to mark the above rotor position on the distributor housing because it tells you that the _____ spark plug will fire in the _____ cylinder when the engine _____ - _____ are aligned.
3. The rotor position marks also tell you that when the distributor is reinstalled, the _____ must be resting in the same position if the engine is to start.
4. Marking the position of the distributor on the engine block ensures that when the distributor is reinstalled, it will be set in the same engine _____ position.
5. Put a *T* if the statement is true, and an *F* if it is false.
   _____ On distributors that have a drive gear, you should mark the last position of the rotor when the distributor is removed.
6. Which one of the following procedures for preparing to remove the distributor is out of place?
   _____ a. Disconnect the vacuum hose(s).
   _____ b. Disconnect the coil primary wire.
   _____ c. Locate and clean the timing marks.
   _____ d. Mark the #1 spark plug wire location on the distributor cap and the distributor body.
   _____ e. Hook up the remote starter switch.
7. Which one of the following procedures for removing the distributor is out of place?
   _____ a. Mark the rotor position on the distributor body.
   _____ b. Mark the base of the distributor and the engine block.
   _____ c. Mark the last position of the rotor on the distributor body.
   _____ d. Remove the distributor hold-down bolt and hold-down clamp.
   _____ e. Remove the distributor.

Now turn to the back of this book and check your answers for Exercise 9.

EXERCISE 10

1. Before the distributor is installed, the rotor must be aligned with:
   _____ a. the mark made on the distributor housing before the distributor was removed
   _____ b. the vacuum advance chamber on the side of the distributor
   _____ c. the mark made on the distributor housing after the distributor was removed
   _____ d. the mark made on the engine block

2. After the distributor is reinstalled, the rotor must be aligned with:
   _____ a. the mark made on the distributor housing before the distributor was removed
   _____ b. the vacuum advance chamber on the side of the distributor
   _____ c. the mark made on the distributor housing after the distributor was removed
   _____ d. the mark made on the engine block

3. It is important to align the distributor with the mark made on the engine block because:
   _____ a. the distributor will be in proper alignment with the vacuum hoses
   _____ b. the distributor will be placed in the same engine timing position as the position before removal
   _____ c. the distributor is in proper alignment with the distributor cap and spark plug wires
   _____ d. the distributor is in proper alignment with the hold-down clamp

4. The steps for installing a distributor are listed out of order below. Number the steps to show the correct sequence.

   Steps

   _____ a. Install the distributor gasket on the engine block.
   _____ b. Turn the rotor on the distributor until its tip aligns with the ***last*** marking made on the distributor body.
   _____ c. Align the mark on the distributor body with the locating mark on the engine block.
   _____ d. Install the distributor on the engine. The rotor should align to the first marking made on the distributor body.
   _____ e. Install the distributor hold-down clamp and bolt.
   _____ f. Attach the distributor-to-coil primary wire.

5. Why should you leave the vacuum hose or hoses disconnected after installing the distributor?

   _____

   _____

Now turn to the back of this book and check your answers for Exercise 10.

EXERCISE 11

1. Before installing the distributor after the engine has been cranked accidentally, you should do the following:

   a. Remove the _____ spark plug.

   b. Place a _____ over the spark plug hole.

   c. Crank the engine until you feel compression _____.

   d. Check to see that the engine _____ _____ are aligned according to the manufacturer's specifications.

2. To install the distributor on the engine, you should do the following:

   a. With the distributor fully seated in the block, point the _____

   toward the _____ _____ _____

   _____ in the distributor cap.

   b. Rotate the distributor body until the contact points just start to _____.

   c. Tighten the distributor _____ bolt.

3. If the distributor is not fully seated against the engine block, turn the _____

   slightly to slide the distributor shaft into the _____

   _____ shaft.

Now turn to the back of this book and check your answers for Exercise 11.

PERFORMANCE CHECKLIST—P.O. 10

The instructor will provide either a live vehicle or a live engine. Remove and install the distributor. All of the performances below must be accomplished.

Student Performances	Instructor Ratings		
	Acceptable	Not Acceptable	Omit
1. Disabled the ignition.			
*2. Cranked engine until the timing marks aligned.			
*3. Marked the appropriate positions on the distributor body, cap, and engine block, as necessary.			
4. Removed the hold-down screw and plate.			
5. Removed the distributor from the engine.			
*6. Marked the last position of the rotor.			
7. Installed the distributor in the engine.			
8. Replaced the hold-down plate and bolt.			
9. Replaced all leads.			
10. Adjusted the dwell, engine idle, and timing.			
11. Used the proper tools and equipment.			
12. Followed appropriate safety precautions.			
13. Performed tasks in an acceptable amount of time.			

*The instructor may omit these steps to see if the student can install a distributor without the benefit of markings.

Keep a copy of this checklist for your records.

PRETEST—P.O.11

NAME _____

1. Check all the safety practices listed below that you should follow.
   - _____ a. Use fender covers when working under the hood.
   - _____ b. Use the proper adapters as necessary when mounting distributors in the distributor tester.
   - _____ c. Keep long hair under a hat.
   - _____ d. Wear eye protection when using a distributor tester.
   - _____ e. Securely bottom the distributor drive gear in the tester chuck.
   - _____ f. Do not crank the engine while cleaning the timing marks.
   - _____ g. Be sure to firmly attach the rotor when using a distributor tester.

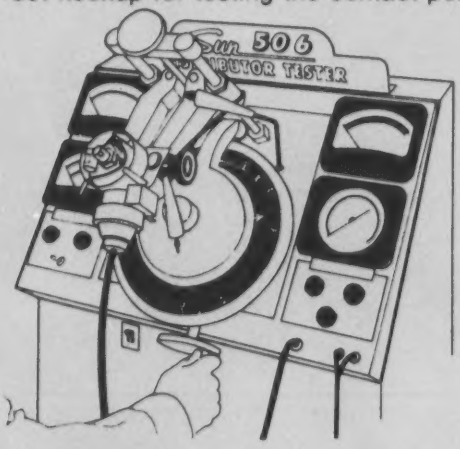
2. The steps for mounting a distributor on a distributor tester are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1	a. Place the distributor in the clamp arms with the vacuum unit to the right.
_____ 2	b. Tighten the chuck and tester clamp arms.
_____ 3	c. Raise the tester clamp arms.
_____ 4	d. Lower the distributor until the drive gear or shaft is in the tester chuck.
_____ 5	e. Wash and clean the distributor body.
_____ 6	f. Check the distributor shaft for drag.
_____ 7	g. Lightly tighten the clamp arms.

3. Which of the following conditions would most likely result in a change in ignition timing?
   - _____ a. burned points
   - _____ b. excessive cam lobe wear
   - _____ c. defective electrical leads
   - _____ d. excessive distributor shaft play
   - _____ e. excessive cam lubrication

4. Which of the following repairs might correct a changing contact point dwell?
   - _____ a. lubrication of the breaker plate assembly
   - _____ b. replacement of the contact points
   - _____ c. replacement of the distributor bushing
   - _____ d. replacement of the distributor cam

5. Draw in the correct hookup for testing the contact points with a distributor tester.



Adapted from *Performance Provers from Sun. A Complete Line of Automotive Tune-Up and Service Equipment.* Used with permission of Sun Electric Corporation.

6. The contact point spring tension is checked on a distributor tester when:

_____ a. the dwell meter reading just starts to register
_____ b. the dwell meter reading just starts to fall to zero

7. During a distributor test, which of the following conditions would *not* cause dwell variation?

_____ a. contact point float
_____ b. a bent distributor shaft
_____ c. a worn rubbing block
_____ d. worn distributor shaft bushings

8. Cam lobe accuracy and point bounce are detected on the distributor tester:

_____ a. visually
_____ b. with a tester degree ring
_____ c. with a dwell meter
_____ d. with a tachometer

9. The function of the mechanical advance unit is to:

_____ a. alter timing as the intake manifold vacuum changes
_____ b. alter timing as the engine RPM changes
_____ c. decrease dwell as the engine RPM changes

10. Incorrect weights or springs in a mechanical advance unit would very likely result in:

_____ a. poor advance at low RPM, but proper functioning at high RPM
_____ b. poor advance at all RPM
_____ c. excessive cam lobe wear

11. Which of the following statements about mechanical advance weight springs is correct?

_____ a. There are usually four springs in a set.
_____ b. The high-tension spring has the most coils.
_____ c. The low-tension spring is called the secondary spring.
_____ d. The high-tension spring prevents over-advance at high RPM.

12. The steps for adjusting mechanical advance weight springs are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1	a. Adjust the primary spring.
_____ 2	b. Release the tension in both springs.
_____ 3	c. Adjust the secondary spring.
_____ 4	d. Recheck the mechanical advance against specifications.

13. Check all correct statements.

_____ a. Most vacuum advance units cannot be repaired.
_____ b. The primary diaphragm retards the spark.
_____ c. Some vacuum advance units can be adjusted.
_____ d. Vacuum advance lines are usually connected to the intake manifold.
_____ e. Some vacuum advance units have two independent diaphragms.

14. When the throttle of a vehicle is opened, the vacuum advance unit should cause the breaker plate to:

_____ a. remain stationary
_____ b. advance the spark timing
_____ c. retard the spark timing
_____ d. move in a series of jerks

15. Which of the following conditions would probably *not* be a result of poor timing advance on an engine?

_____ a. ping or spark knock
_____ b. weak spark
_____ c. hard starting
_____ d. poor fuel economy
_____ e. poor acceleration

16. Look at the two charts below.

DISTRIBUTOR MODEL		CENTRIFUGAL ADVANCE					
Standard	Uni-Set	Start		Intermediate		Maximum	
		Deg.	RPM	Deg.	RPM	Deg.	RPM
1112205	1112243	0	600	5	850	11	2300
1112807	1112513	0	575	4.5	850	9	1950
1112804	1112234	0	600	6.5	1065	12	1790

DISTRIBUTOR PART NO.	VACUUM ADVANCE (DISTR. Deg. and In. of Hg.)			
	Deg.	In. Hg.	Deg.	In. Hg.
1112807	0	8 - 10	10	16
1112808	0	4 - 6	12.5	11

From these charts, what would be the proper amount of vacuum advance for Distributor Number 1112807 at 1950 RPM?

_____ a. 0°
_____ b. 4.5°
_____ c. 9°
_____ d. 12°
_____ e. none of the above

17. Which of the following can be done with the distributor in the engine?

_____ a. timing advance adjustment
_____ b. vacuum advance adjustment
_____ c. vacuum retard diaphragm check
_____ d. timing advance check

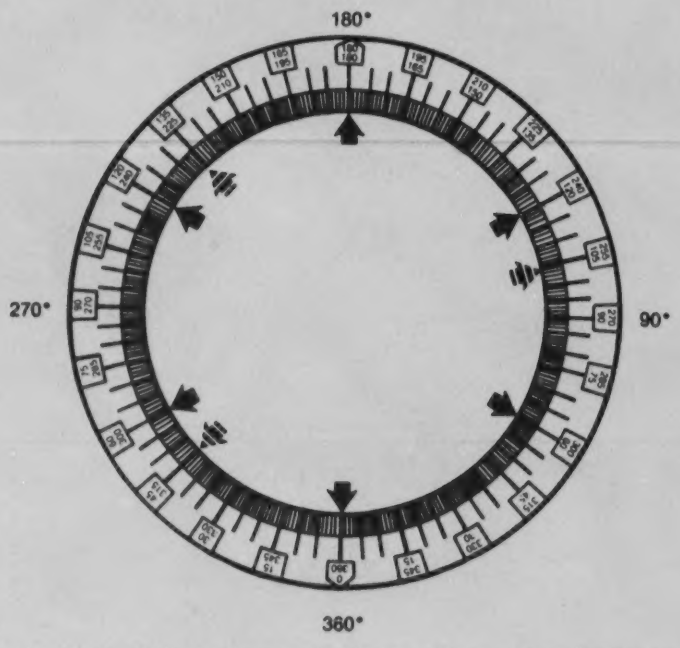
18. Which of the following provides the greatest amount of timing change at 2,000 RPM?

_____ a. the initial timing setting
_____ b. the vacuum advance mechanism
_____ c. the mechanical advance mechanism
_____ d. the dwell setting or point gap

19. If a sudden change in dwell occurs as the distributor tester RPM is increased, you will know that:

_____ a. the distributor cam lobes are worn
_____ b. one or both of the advance units are defective
_____ c. the point spring tension is too weak
_____ d. the distributor shaft is bent or worn
_____ e. the distributor cam has excessive lubricant

20. Look at the diagram of a distributor tester below.



If you saw a pattern like this while testing a distributor from a 4-cylinder you could be fairly certain that:

_____ a. the distributor cam lobes were worn
_____ b. the point spring tension was too strong
_____ c. the timing advance mechanism was not operating properly
_____ d. the condenser was defective
_____ e. the breaker plate assembly was worn

When you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you to either practice the work activities or to study the material covered by this test.

EXERCISE 12

1. A synchroscope is another name for a _____ _____ .
2. The distributor tester is designed to _____ and _____ distributors while they are outside the vehicle engine.
3. Two visual inspections must be done on the distributor before it is lowered into the chuck of the distributor tester.
   They are:

   a. _____

   b. _____

4. A dirty distributor will get the _____ _____ dirty and may cause it to work incorrectly.
5. Place the distributor in the tester clamp arms so that the distributor _____

   _____ _____ is pointing to your right.
6. The distributor must be properly _____ in the tester.
7. After the distributor is mounted in the tester, turn the distributor shaft by hand and check to see that it is not _____.
8. To mount the distributor on the distributor tester, you should do the following:

   a. _____ the body of the distributor to clean it.

   b. Raise the tester _____ _____ and clamp the distributor body in place.

   c. Visually check the distributor shaft _____ _____

      condition, and rotate the shaft for _____ condition.

   d. Lower the distributor until the distributor drive gear is in the _____ of the tester.

   e. Tighten the _____ _____ and the tester _____ arms.

   f. After the distributor is mounted, turn the distributor shaft by hand and check to see that it is not _____.

9. There are several visible defects that may develop in a distributor. Write down the method for checking each defect.

Defects	**Method for Checking**
a. too much side play in the distributor shaft	
b. too much binding or wobble in the breaker plate	
c. too much wear in the cam lobe	
d. not enough or too much lubrication	
e. worn, frayed, or oil-soaked electrical leads	
f. dirty, pitted, or burned contact points	

10. Below is a list of distributor defects and corrections. Put the number of the correction next to the defect it will correct. (A number may be used more than once.)

Defects

_____ a. too much side play in the distributor shaft

_____ b. too much end play in the distributor shaft

_____ c. too much binding in the distributor shaft

_____ d. too much binding or wobbling of the breaker plate

_____ e. too much wear of the cam lobe

_____ f. too much lubrication

_____ g. not enough lubrication

_____ h. worn, frayed or oil-soaked electrical leads

_____ i. dirty, pitted, or burned contact points

Corrections

1. Lubricate the cam with cam lubricant. Lubricate the oilers.
2. Replace the cam.
3. Replace the shaft and bushings and/or the distributor housing.
4. Replace the contact points.
5. Replace the breaker plate assembly and/or the nylon guides.
6. Replace the distributor seal, and/or clean the breaker plate assembly.
7. Replace the condenser and/or the coil lead, and tighten the connections.
8. Replace the distributor shaft thrust washer(s).

11. Tell why each of the following practices is unsafe.

a. Operating the distributor tester with the rotor on the distributor shaft:

_____

b. Operating the distributor tester without wearing eye protection equipment:

_____

c. Mounting the distributor on the distributor tester without using the proper adapters where required: _____

_____

d. Bottoming the distributor drive gear or shaft into the distributor tester:

_____

Now turn to the back of this book and check your answers for Exercise 12.

EXERCISE 13

1. When testing contact point spring tension with a distributor tester you should do the following:

   a. Turn the distributor shaft until the contact points are _____.

   b. Turn the motor switch to the proper distributor shaft _____.

   c. Hook the spring tension gauge over the _____ contact point.

   d. Pull the gauge straight out. Record the reading of the _____

   _____ _____ when the _____

   _____ starts to fall to 0°.

2. To test for contact point dwell variations, increase the distributor shaft speed

   _____ up to 2,500 RPM and watch the _____

   _____ for changes.

3. To test for contact point float, increase the distributor shaft speed_____

   up to 2,500 RPM and look for any sudden change in _____.

4. Check all correct answers. To test for contact point bounce, you should:

   _____ a. increase the distributor shaft speed to 2,500 RPM
   _____ b. watch the flashing arrows on the tester degree ring
   _____ c. check for any additional arrows to see if points are bouncing

5. Check all correct answers. To test for cam lobe accuracy, you should:

   _____ a. operate the distributor shaft at 1,000 RPM
   _____ b. rotate the degree ring by hand until the 0° point is aligned with any flashing arrow
   _____ c. look at each of the flashing arrows; they should be evenly spaced within one degree

6. Too much drop in dwell as the distributor speed is quickly increased may mean that there is:

   _____ a. point bounce
   _____ b. point float
   _____ c. a poor condenser ground
   _____ d. all of the above

7. Extra arrows on the degree ring of the distributor tester mean that there is:

   _____ a. point float
   _____ b. point bounce
   _____ c. both of the above
   _____ d. neither of the above

For Questions 8-9, put a *T* if the statement is true, and an *F* if the statement is false.

8. _____ Dwell variation refers to any change in dwell when the engine speed increases gradually or slowly.

9. _____ A sudden change in dwell when the engine speed increases means that the contact point has floated.

10. Arrows that are not spaced evenly around the degree ring means that there is:

_____ a. contact point bounce
_____ b. contact point float
_____ c. cam lobe wear
_____ d. distributor shaft bushing wear

11. When testing the distributor shaft, bushing, and breaker plate condition with a distributor tester,

a. vary the distributor shaft speed from _____ to _____

RPM

b. look for distributor shaft and breaker plate _____

Now turn to the back of this book and check your answers for Exercise 13.

EXERCISE 14

For Questions 1-11, write a *T* in the blank if the statement is true, and an *F* if the statement is false.

1. _____ The main function of the distributor is to deliver the spark to the spark plugs at exactly the right time.
2. _____ The mechanical advance mechanism controls the spark advance in correct proportion to engine speed.
3. _____ Initial or basic timing is timing advance set at recommended engine idle speeds.
4. _____ Mechanical or centrifugal advance regulates timing advance with changes in engine speed.
5. _____ When the engine speed increases, the spark should advance.
6. _____ When the engine speed decreases, the spark should retard.
7. _____ The degree of movement of the advance mechanism weights is controlled by spring tension.
8. _____ The primary spring controls weight movement at lower engine speeds.
9. _____ The secondary spring controls weight movement at higher engine speeds.
10. _____ Timing advance is accomplished by rotating the distributor cam to open the points earlier.
11. _____ Manufacturer's specifications provide degree readings at specific engine speeds.
12. To increase the timing advance on distributors with adjustable springs, you should

    _____ the spring tension.
13. To decrease the timing advance on distributors with adjustable springs, you should

    _____ the spring tension.

Now turn to the back of this book and check your answers for Exercise 14.

EXERCISE 15

For Questions 1-5, write a *T* in the blank if the statement is true, and an *F* if the statement is false.

1. _____ Vacuum advance changes spark timing at various engine loads.
2. _____ Vacuum advance mechanisms are controlled and operated by the carburetor throttle opening and vacuum.
3. _____ The vacuum, acting on the diaphragm, causes the breaker plate to rotate in a direction opposite to the direction of the cam rotation.
4. _____ The dual diaphragm advance/retard mechanism has a primary diaphragm and a secondary diaphragm.
5. _____ The purpose of the vacuum advance mechanism is to control the spark timing in relation to the throttle opening and the engine load.
6. To test vacuum chamber leaks, you should do the following:
   a. Set the distributor shaft speed at _____ RPM.
   b. Connect the vacuum hose to the distributor _____ _____ inlet.
   c. Clamp the vacuum hose _____.
   d. Adjust the vacuum regulator until the vacuum gauge reads about _____ inches.
   e. Open the _____ on the vacuum hose, and watch the vacuum gauge.
7. To test vacuum plate action, you should do the following:
   a. Set the distributor shaft speed at _____ RPM.
   b. Vary the vacuum from _____ to _____ inches, and watch the operation of the breaker plate.

8. To test vacuum advance, you should do the following:

   a. Set the distributor shaft speed at _____ RPM, and set the ZERO on the degree ring to any flashing arrow.

   b. Increase the vacuum and record when the _____ first starts to move.

   c. _____ the vacuum to the first reading specified by the vehicle manufacturer. Record in _____ the new position of the arrow on the degree ring.

   d. Then, _____ the vacuum to each of the specified amounts. Record in _____ the new position of the arrow each time.

   e. Reduce the _____ to zero. The arrow should return to _____.

9. To test the vacuum retard of a dual diaphragm vacuum mechanism, you should do the following:

   a. Connect the vacuum hose to the vacuum _____ inlet.

   b. Operate the tester, following the _____ procedures as you used when testing the vacuum advance.

For Questions 10-12, write a *T* in the blank if the statement is true, and an *F* if the statement is false.

10. _____ A vacuum advance unit that has a leak should be replaced.

11. _____ A worn breaker plate assembly will vary the contact point dwell.

12. _____ Incorrect advance at a specified vacuum does not provide proper spark timing.

13. Briefly describe the vacuum advance adjustments necessary to increase and decrease the timing on a unit having shim washers.

    a. To increase timing: _____

    b. To decrease timing: _____

14. Briefly describe the vacuum advance adjustments necessary to increase and decrease the timing on a unit that uses an allen wrench.

    a. To increase timing: _____

    b. To decrease timing: _____

15. What are the three kinds of timing devices?

a. _____

b. _____

c. _____

16. List four critical engine malfunctions caused by incorrect timing and incorrect timing advances.

a. _____

b. _____

c. _____

d. _____

Now turn to the back of this book and check your answers for Exercise 15.

EXERCISE 16

1. To test the distributor mechanical advance with the distributor on the engine, you should do the following:

   a. Disconnect the _____ hoses.

   b. Set _____ _____ to the manufacturer's specifications.

   c. Run the engine at _____ RPM.

   d. Move the timing light time/advance knob to bring the _____ _____ back to the initial setting.

   e. Read the _____ results on the timing light meter.

2. To test the distributor vacuum advance with the distributor on the engine, you should do the following:

   a. Connect the _____ hoses.

   b. Set the _____ _____ to manufacturer's specifications.

   c. Run the engine at _____ RPM.

   d. Move the timing light time/advance knob to bring the _____ _____ back to the initial setting.

   e. Read the _____ results on the timing light meter.

3. To test the distributor vacuum retard with the distributor on the engine, you should do the following:

   a. Connect the vacuum hose from the intake manifold to the _____ _____ of the vacuum advance mechanism.

   b. Check the _____ at engine _____ speed.

   c. Make sure the timing is _____ to less than that of the initial timing.

For Questions 4-9, write a *T* in the blank if the statement is true, and an *F* if the statement is false.

4. _____ Timing advance can be accurately adjusted with the distributor on the engine.

5. _____ Initial timing has nothing to do with timing advance tests.

6. _____ Timing advance test readings made with the distributor on the engine are accurate.

7. _____ A vacuum advance test is made with the vacuum hose(s) disconnected and plugged and the distributor on the engine.

8. _____ When the distributor is on the engine, vacuum advance test readings are correct when they read the same as the mechanical advance.

9. _____ When the distributor is on the engine, a vacuum retard test is done with the vacuum hose(s) disconnected.

Now turn to the back of this book and check your answers for Exercise 16.

PERFORMANCE CHECKLIST—P.O. 11

The instructor will provide a shop distributor and either a live vehicle or a live engine. Strobe the distributor and adjust the advance mechanisms. All of the performances below must be accomplished.

Student Performances	**Instructor Ratings**		
	Acceptable	Not Acceptable	Omit
*1. Removed the distributor from the vehicle.			
2. Mounted the distributor in the tester.			
3. Visually inspected the distributor.			
4. Tested the following, and recorded the results:			
a. condenser			
b. contact point resistance			
c. contact point spring tension			
d. contact point alignment			
e. contact point dwell and dwell variation			
f. contact point float and bounce			
g. cam lobe accuracy			
h. shaft, bushings, and breaker plate			
i. mechanical advance			
j. vacuum advance and retard			
5. Adjusted the mechanical advance.			
6. Adjusted the vacuum advance and retard.			
*7. Installed the distributor.			
8. Used the proper tools and equipment.			
9. Followed all appropriate safety precautions.			
10. Performed tasks in an acceptable amount of time.			

*These steps can be omitted if both the distributor and the live engine have been provided.

Keep a copy of this checklist for your records.

PRETEST—P.O.12

NAME _____

1. Check all the safety practices listed below that you should follow.
   - _____ a. Always clamp a distributor at the ribbed section of its housing
   - _____ b. Keep long hair under a hat.
   - _____ c. Always secure the rotor before doing tests on a distributor tester.
   - _____ d. Clean and lubricate the distributor parts before assembly.
   - _____ e. Wear eye protection when using punches, grinders, or drifts.
   - _____ f. Securely bottom the distributor shaft in the tester chuck.
   - _____ g. Use only a soft jaw vise to clamp a distributor.

2. What is the preferred equipment for holding a distributor?
   - _____ a. a bench vise
   - _____ b. a bench vise with soft jaws
   - _____ c. a bench vise with a distributor clamp tool
   - _____ d. a distributor clamp tool
   - _____ e. a carpenter's press

3. Where can you find specifications for overhauling a distributor?
   - _____ a. in the vehicle owner's manual
   - _____ b. in a technical service manual
   - _____ c. in the test equipment manufacturer's manual
   - _____ d. in EPA guidelines for service

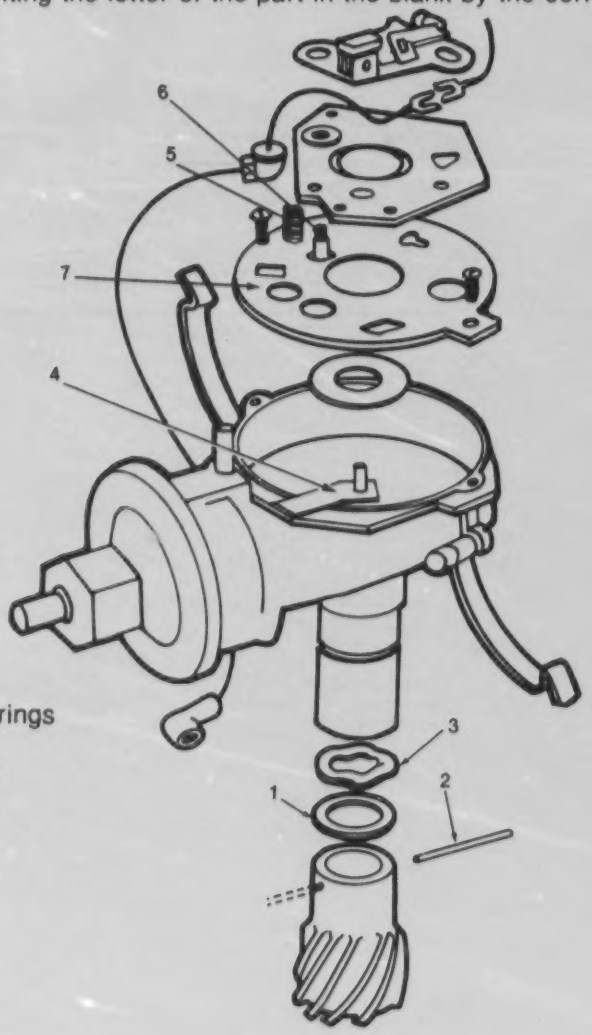
4. Which of the following is *not* one of the three main assemblies of a distributor?
   - _____ a. the mechanical advance assembly
   - _____ b. the breaker plate assembly
   - _____ c. the vacuum advance assembly
   - _____ d. the distributor shaft and drive gear assembly

5. A Ford distributor is constructed with:
   - _____ a. the breaker plate assembly above the mechanical advance
   - _____ b. the breaker plate assembly below the mechanical advance

6. The steps for disassembling a Chrysler-made distributor are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1	a. Make a visual inspection of all parts.
_____ 2	b. Remove the distributor cap and rotor.
_____ 3	c. Clamp the distributor in a vise.
_____ 4	d. Remove the breaker plate assembly.

7. Identify the parts in the diagram below by writing the letter of the part in the blank by the correct number.



_____ 1
_____ 2
_____ 3
_____ 4
_____ 5
_____ 6
_____ 7

a. vacuum link pivot
b. distributor gasket
c. ground spring
d. cam weight base
e. thrust washer
f. retainer pin
g. subplate
h. mechanical advance springs
i. spring retainer
j. breaker plate pivot post
k. rotor
l. wave washer

8. Write the letter of the proper lubricant in the blank by each distributor part listed below.

_____ distributor shaft
_____ distributor cam
_____ breaker plate
_____ lubricating wick
_____ advance weight pivot posts

a. light grease
b. lightweight machine oil
c. powdered graphite
d. cam lubricant
e. heat-resistant lubricant
f. motor oil

9. When you check the distributor shaft side play, the dial indicator plunger should be:

_____ a. against the stationary point arm
_____ b. against the movable point arm
_____ c. not touching either contact point arm

57

10. What equipment is necessary in order to check the distributor shaft side play?

_____ a. a torque wrench and a dial indicator
_____ b. a dial indicator and a spring scale
_____ c. a spring scale and feeler gauges
_____ d. feeler gauges and a dial indicator

11. Which one of the following statements about retainer pins is *not* true?

_____ a. A properly peened pin looks rounded off.
_____ b. Old retainer pins should be removed with a punch.
_____ c. Split-type pins are peened to hold them in place.
_____ d. The retainer pin attaches the distributor shaft to the drive gear.

12. The steps for assembling a Delco-Remy window-type distributor are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	**Steps**
_____ 1	a. Install the mechanical advance assembly.
_____ 2	b. Check its operation by using a distributor tester.
_____ 3	c. Clean and lubricate all parts.
_____ 4	d. Install the distributor shaft and the drive gear.
_____ 5	e. Install the breaker plate assembly.

When you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you to either practice the work activities or to study the material covered by this test.

EXERCISE 17

1. Briefly explain why each of the following practices is unsafe.

a. Using improper tools and equipment to overhaul a distributor: _____

_____

b. Clamping the distributor body part in a vise without using soft clamps: _____

_____

c. Assembling a distributor without applying lubricant to the parts: _____

_____

d. Using punches or grinding wheels without wearing the proper eye protection: _____

_____

2. The part of the distributor that is clamped in a vise is the:

_____ a. distributor body
_____ b. drive gear
_____ c. ribbed section of the distributor housing
_____ d. distributor shaft

3. The distributor part number is important to know when overhauling distributors because:

_____ a. it will help you find the correct timing advance specifications in a technical service manual
_____ b. it will help you find the correct initial timing specifications in a technical service manual
_____ c. it will help you find in a technical service manual the correct procedures for installing the distributor on the engine
_____ d. it will help you find in a technical service manual the correct procedures for adjusting the initial timing

4. There are three main assemblies that make up the inside of a distributor. They are:

a. _____

b. _____

c. _____

Now turn to the back of this book and check your answers for Exercise 17.

EXERCISE 18

1. On a Delco-Remy window-type distributor, the _____ _____ _____ is located above the breaker plate assembly.
2. There are three main assemblies to remove from the distributor: the mechanical advance mechanism, the distributor shaft and drive gear, and the _____.
3. Before removing the distributor shaft, you must first remove the distributor _____ _____.
4. If the distributor shaft bushings for a Delco-Remy window-type distributor are worn, the distributor _____ must be replaced.
5. It is important to _____ the friction or bearing surfaces of the breaker plate assembly before installing them.
6. When installing a distributor drive gear, you should always use a new _____.
7. It is important to _____ the distributor shaft and the distributor cam before installing them.
8. The distributor housing and parts should be _____ before inspecting them for wear.
9. The _____ _____ holds the breaker plate assembly in place in the distributor housing.
10. Rounding the ends of the distributor retainer or gear pin to lock it in place is called _____.

Now turn to the back of this book and check your answers for Exercise 18.

60

EXERCISE 19

1. On Ford and Chrysler distributors, the _____ _____ _____ is located below the breaker plate assembly.
2. There are three main assemblies to remove from the distributor: the breaker plate assembly, the distributor shaft and drive gear, and the _____.
3. Before removing the distributor shaft, you must first remove the distributor _____ _____.
4. Before removing a mechanical advance mechanism, you must first remove the _____ _____ assembly.
5. It is important to _____ the friction or bearing surfaces of the breaker plate assembly before installing it.
6. When installing a distributor drive gear, you should always use a new _____.
7. It is important to _____ the distributor shaft before installing it.
8. The distributor shaft fit is correct when the shaft can be turned _____ without dragging or binding.
9. Before installing a breaker plate assembly, you must first install the _____ _____ _____.

Now turn to the back of this book and check your answers for Exercise 19.

61

PERFORMANCE CHECKLIST—P.O. 12

The instructor will provide a distributor. Overhaul the distributor. All of the performances below must be accomplished.

Student Performances

1. Clamped the distributor in a vise.
2. Located the manufacturer's specifications for wear, dwell, and timing advance.
3. Disassembled the distributor.
4. Washed, cleaned and inspected parts for wear.
5. Replaced defective parts as necessary.
6. Assembled the distributor, checking play tolerances.
7. Checked distributor operation with a distributor tester.
8. Made adjustments as necessary.
9. Used the proper tools and equipment.
10. Followed all appropriate safety precautions.
11. Performed tasks in an acceptable amount of time.

Instructor Ratings

Acceptable	Not Acceptable	Omit

Keep a copy of this checklist for your records.

PRETEST—P.O. 13

NAME _____

1. Check all the safety practices listed below that you should follow.
   - _____ a. Avoid wearing loose clothing or jewelry.
   - _____ b. Always rely on your memory when hooking up testers.
   - _____ c. Use fender covers only if you are wearing a belt.
   - _____ d. Route oscilloscope leads away from the engine fan and fan belts.
   - _____ e. Avoid making electrical tests in or around wet areas.
   - _____ f. Keep long hair under a hat.

2. Which of the following conditions would indicate excessive primary circuit resistance?
   - _____ a. failure of the engine to start
   - _____ b. excessive CO in engine exhaust
   - _____ c. a fat blue spark from the coil to ground
   - _____ d. a ballast resistor value of 1 ohm
   - _____ e. a voltage drop of .2 volts through the primary circuit

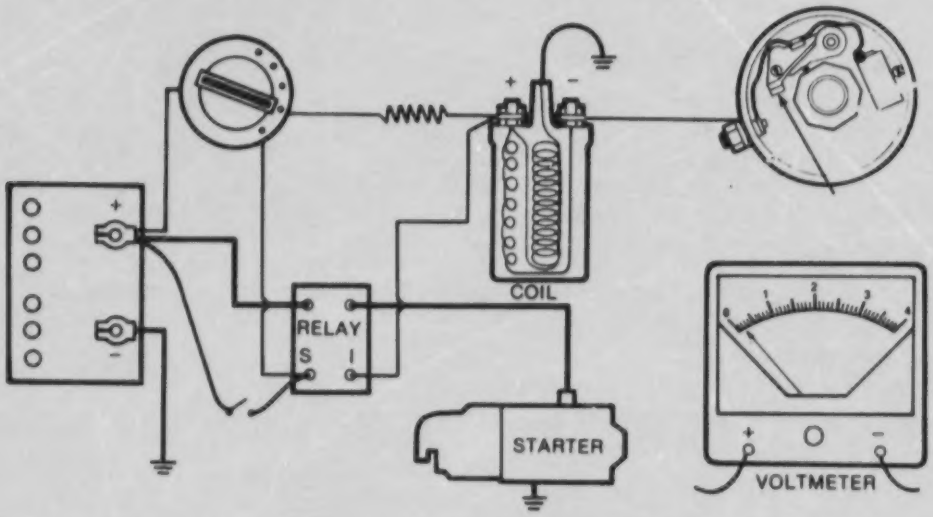
3. Which one of the following statements about voltage-drop tests is true?
   - _____ a. The lower the voltage reading, the lower the circuit resistance.
   - _____ b. Voltage-drop tests are performed with the ignition off.
   - _____ c. The voltmeter is always connected in the same direction as the current flow.
   - _____ d. The higher the voltage drop, the lower the circuit resistance.

4. If spark intensity test results are poor, you should:
   - _____ a. make a coil-to-ground resistance test
   - _____ b. visually inspect the primary wiring
   - _____ c. make a battery voltage test
   - _____ d. make a coil primary resistance test
   - _____ e. make a contact point resistance test

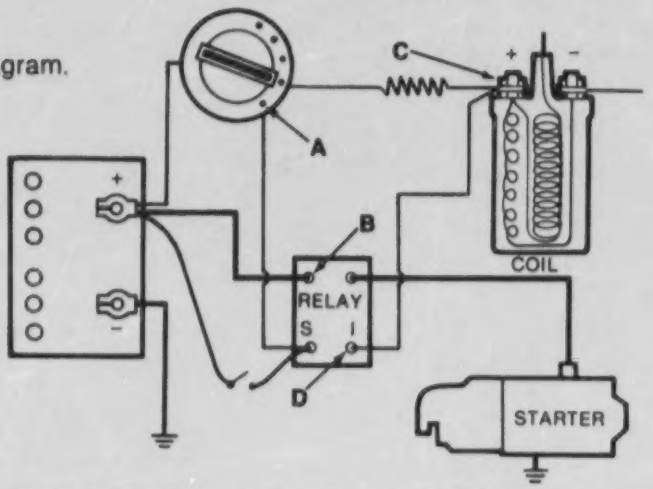
5. During a battery voltage test, a good 6-cell battery should have a voltage of at least:
   - _____ a. 2.2 volts
   - _____ b. 6 volts
   - _____ c. 9.6 volts
   - _____ d. 12 volts
   - _____ e. 13.2 volts

6. The coil-to-ground voltage test is performed with:
   - _____ a. the points fully open
   - _____ b. the engine at idle RPM
   - _____ c. all lights and accessories off
   - _____ d. the ignition switch set to *off*

7. Draw the correct hookup for testing the contact points for high resistance.



8. Look at the following diagram.



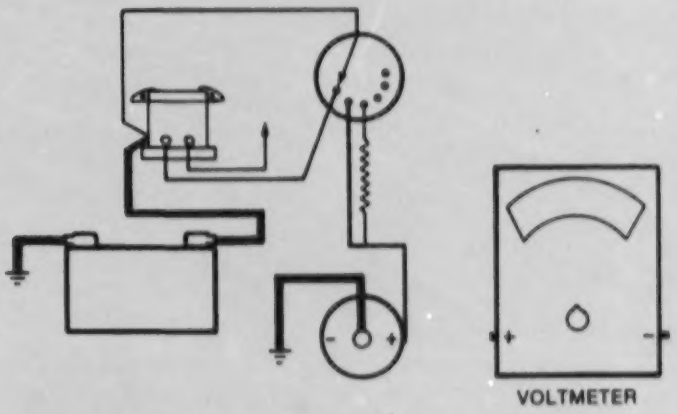
In the ***start*** position, a continuity light tester lights up at Points A, C, and D. In the ***run*** position, it does not light up at Point C. The problem with the circuit is probably:

_____ a. faulty coil-to-ground resistance
_____ b. a defective coil
_____ c. a loose connection of the distributor primary wire
_____ d. a defective ballast resistor
_____ e. poor connections at the ignition switch

9. The result of a primary start circuit (battery-to-coil) resistance test is good when:

_____ a. the measured voltage is below .5 volt
_____ b. the measured voltage is not below 9.6 volts
_____ c. the measured voltage is within .5 volt of the battery voltage
_____ d. the measured voltage is different than the battery voltage by more than .5 volt

10. Draw the correct hookup for a primary start (ground-to-coil) voltage output test.



11. Which of the following tests does *not* require the engine to be cranked?

_____ a. a battery-to-coil circuit resistance test
_____ b. a spark intensity test at the coil
_____ c. a coil-to-ground voltage test
_____ d. a primary start circuit (ground-to-coil) voltage output test

12. The maximum allowable circuit voltage for the primary start circuit resistance test is:

_____ a. .2 at any switch and 0 at any connection
_____ b. .3 at any switch and .5 overall
_____ c. .2 at any lead and .1 at any connection
_____ d. 0 at any connection and .05 at any wire
_____ e. .1 at any wire and .5 at any switch

13. Which one of the following statements about the primary run voltage test (battery-to-coil) is true?

_____ a. The ignition points should be blocked open for the test.
_____ b. The process tests the bypass circuit operation.
_____ c. Normal voltage readings are 5-6.9 volts.
_____ d. The test is made while the engine is cranked.

14. If the ignition switch and contacts are good, what should happen as the switch is turned off and then back on during a primary run circuit test?

_____ a. The voltmeter readings should remain the same.
_____ b. The voltmeter readings should increase.
_____ c. The voltmeter readings should decrease.

15. The ignition resistor wire should allow:

_____ a. no more than 5 volts through the primary circuit
_____ b. no more than 6.6 volts through the primary circuit
_____ c. at least 6.6 volts through the primary circuit
_____ d. no more than 9.6 volts through the primary circuit
_____ e. at least 9.6 volts through the primary circuit

16. The ballast resistor is usually located:

_____ a. near the starter relay on the ignition wire
_____ b. near the coil end of the ignition wire
_____ c. near the distributor end of the ignition wire
_____ d. near the battery or junction block

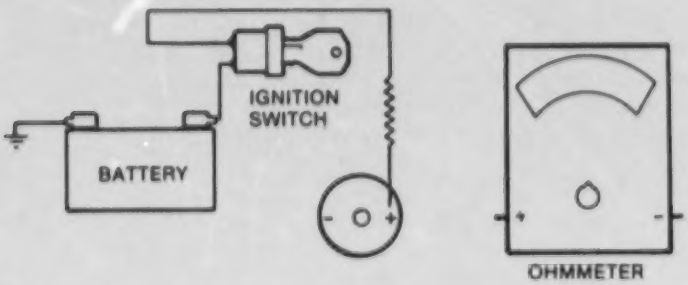
17. The coil draw test is performed with:

_____ a. a dwell meter
_____ b. a tachometer
_____ c. a voltmeter
_____ d. an ammeter
_____ e. an ohmmeter

18. Coil draw is measured with the engine:

_____ a. at rest
_____ b. at cranking RPM
_____ c. at idle RPM
_____ d. at high RPM
_____ e. at rest and at idle RPM

19. Draw the correct hookup for a coil primary resistance test.



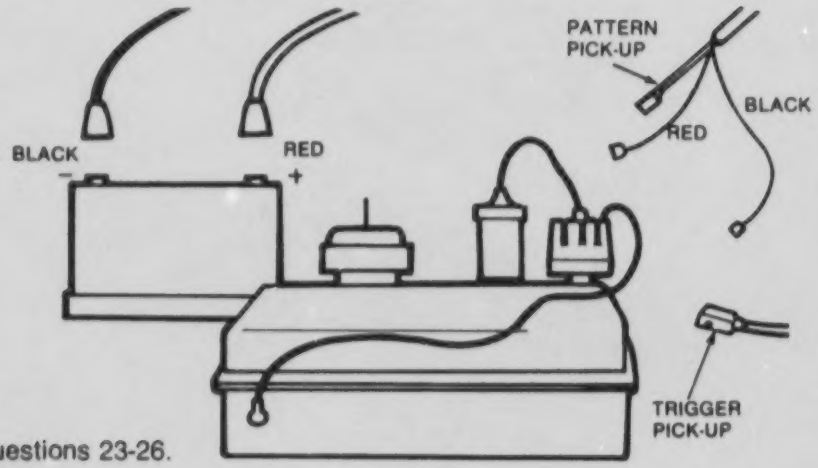
20. A satisfactory reading for a coil secondary resistance test is:

_____ a. much higher than the coil primary resistance test
_____ b. a little higher than the coil primary resistance test
_____ c. a little lower than the coil primary resistance test
_____ d. much lower than the coil primary resistance test

21. A normal waveform on an oscilloscope is displayed as:

_____ a. the amount of amperage over the time
_____ b. the speed of the engine over the time
_____ c. the amount of resistance over the time
_____ d. the amount of voltage over the time

22. Draw the correct hookup of the oscilloscope leads to the engine.



Use the pattern below to answer Questions 23-26.

23. Which letter shows the point at which the contact points close?

_____ a. A
_____ b. B
_____ c. C
_____ d. D
_____ e. E
_____ f. F

24. Which section of the pattern above shows the spark line?

_____ a. A to B
_____ b. B to C
_____ c. C to D
_____ d. D to E
_____ e. E to F

25. Which section of the normal scope waveform can be used to detect a faulty rotor?

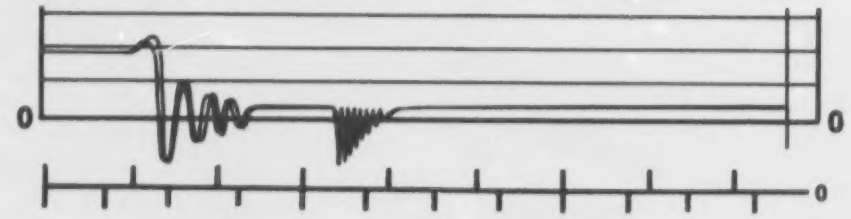
_____ a. the firing section
_____ b. the intermediate section
_____ c. the dwell section
_____ d. any of the above

26. The contact point dwell is measured from:

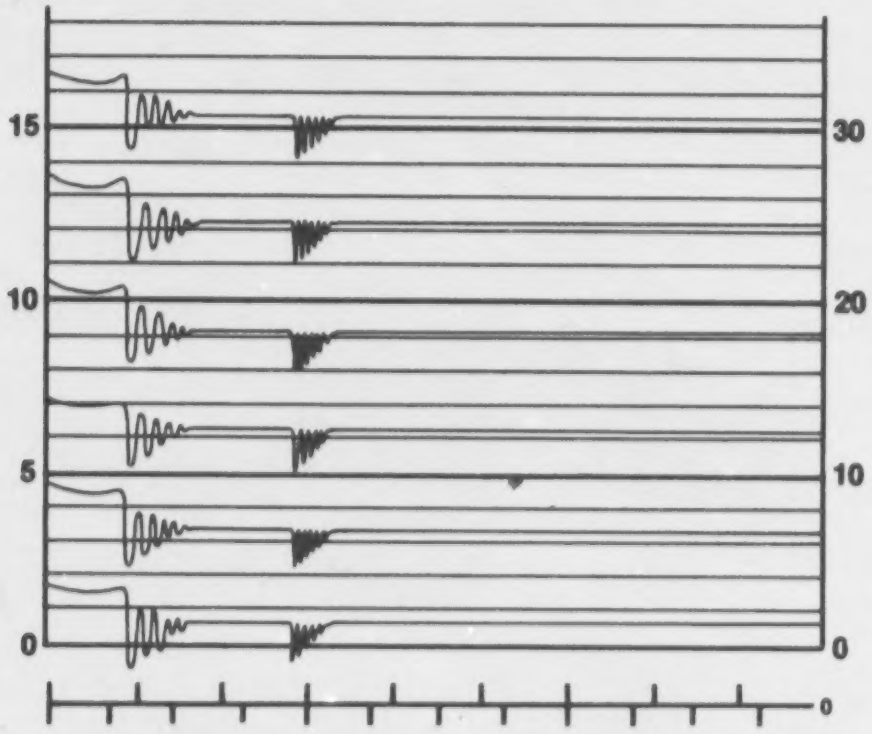
_____ a. C to D
_____ b. D to A
_____ c. F to A
_____ d. F to E
_____ e. E to D

27. Which of the following patterns is a raster pattern?

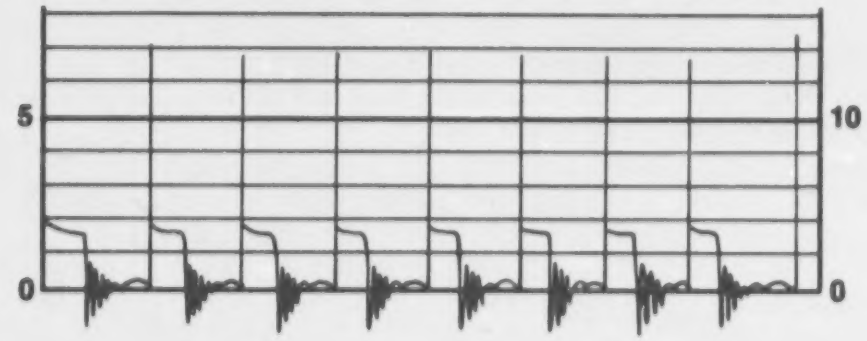
_____ a.



_____ b.



_____ c.



28. The result of a cranking coil output test is good when the voltage spike is:

_____ a. beyond 20 volts on the scale
_____ b. beyond 2 kilovolts on the scale
_____ c. beyond 20 kilovolts on the scale
_____ d. beyond 200 kilovolts on the scale

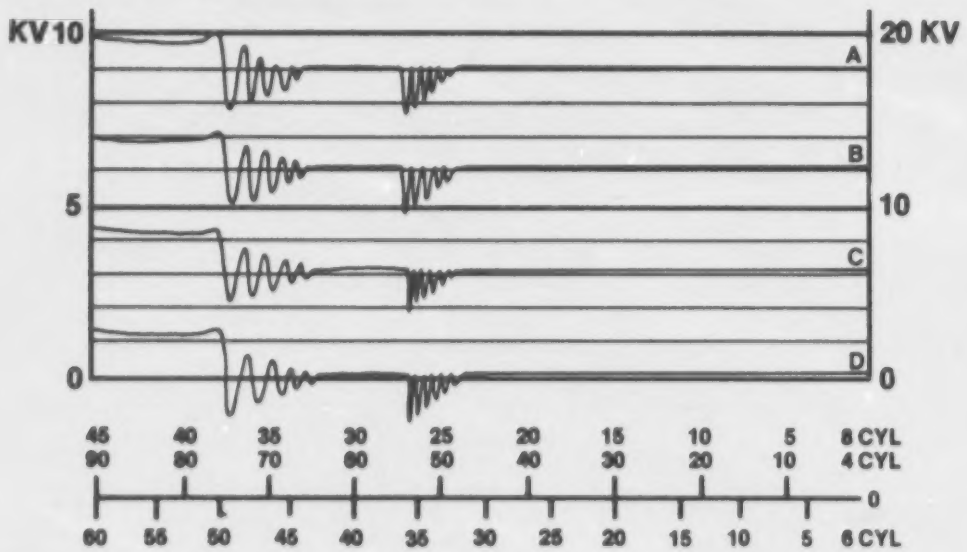
29. A coil connected in reverse polarity would result in:

_____ a. a reversed raster pattern
_____ b. a higher firing voltage required to fire the spark plugs
_____ c. a firing line heading up on the scope display
_____ d. a longer dwell period for the coil

30. A loose or corroded primary lead or connection would show up on a scope screen as:

_____ a. multiple patterns on the screen
_____ b. erratic patterns in the waveform intermediate section
_____ c. erratic patterns in the waveform firing section
_____ d. erratic patterns in the waveform dwell section

Answer Questions 31-32 by using the diagram below.



31. The dwell on this 4-cylinder vehicle is:

_____ a. 20°
_____ b. 26°
_____ c. 34°
_____ d. 52°

32. Which of the following shows the proper firing order of the individual cylinders?

_____ a. D-C-B-A
_____ b. A-C-D-B
_____ c. B-D-C-A
_____ d. C-A-D-B

70

33. Dwell variation is tested by noting dwell changes:

_____ a. from the raster to the superimposed pattern
_____ b. between cylinders on a raster pattern
_____ c. between different engine RPM

34. Which pattern is hardest to use for checking cam lobe accuracy?

_____ a. a superimposed pattern
_____ b. a display pattern
_____ c. a raster pattern

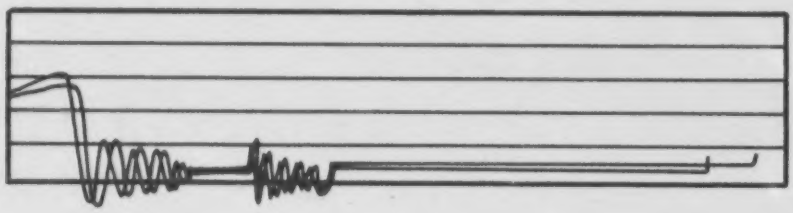
35. Contact point condition is checked by looking at:

_____ a. the point dwell section on the superimposed pattern
_____ b. the point closing oscillations on the raster pattern
_____ c. the residual voltage oscillations on the display pattern
_____ d. the firing spike on the display pattern

36. A defective condenser would ***not*** result in which of the following patterns?

_____ a. an erratic points opening section of the waveform
_____ b. an erratic points closing section of the waveform
_____ c. lack of oscillations in the intermediate waveform

37. Look at the diagram below.



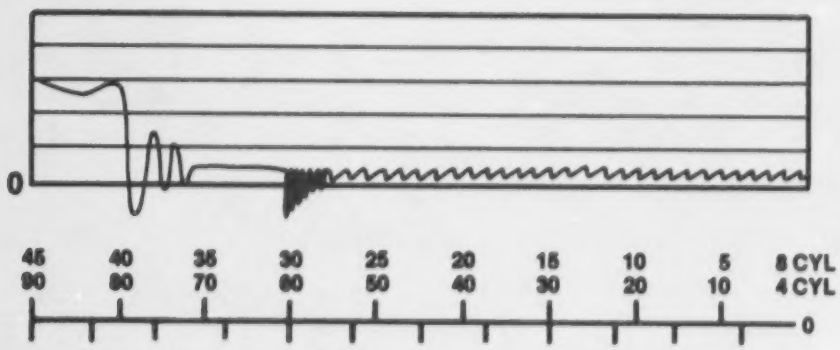
This waveform could ***not*** be caused by:

_____ a. a worn rubbing block
_____ b. worn distributor bushings
_____ c. a loose breaker plate
_____ d. a bent distributor shaft
_____ e. worn cam lobes

38. Match each test below with the area or point you should observe on the scope pattern.

Tests	**Areas or Points on Scope Pattern**
_____ cam lobe accuracy	a. points close signals
_____ coil and condenser	b. pattern appearance
_____ cranking coil output	c. points close and points open signals
_____ loose primary lead	d. dwell section
_____ dwell and dwell variation	e. points open signal and intermediate section
_____ distributor condition	
_____ reversed polarity	
_____ contact point condition	
_____ loose primary connection	

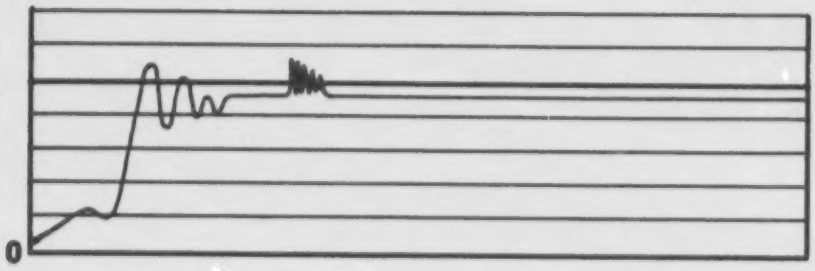
39. Look at the diagram below.



Which of the following conditions could cause this pattern?

_____ a. a loose primary connection
_____ b. excessive point spring tension
_____ c. a binding breaker plate assembly
_____ d. a defective condenser

40. Look at the diagram below.



Which of the following conditions could cause this pattern?

_____ a. reversed coil polarity
_____ b. a bent distributor shaft
_____ c. a loose primary connection
_____ d. a defective condenser
_____ e. weak point spring tension

When you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you to either practice the work activities or to study the material covered by this test.

EXERCISE 20

1. High resistance in the primary circuit leads to poor engine performance. Name three signs of high resistance.

   a. _____

   b. _____

   c. _____

2. The spark intensity test at the coil tells you if the spark is _____,

   _____, or not present.

3. Describe the four procedures for doing a spark intensity test.

   a. _____

   b. _____

   c. _____

   d. _____

4. The primary circuit wiring should be checked for these four things:

   a. _____

   b. _____

   c. _____

   d. _____

5. The direction of the flow of primary current through the coil to the distributor is called _____ _____.

6. The polarity is correct when the battery primary lead is connected to the _____ terminal of the coil.

7. The polarity is correct when the distributor primary lead is connected to the _____ terminal of the coil.

8. The purposes of voltmeter tests of the primary circuit are:

   a. _____

   b. _____

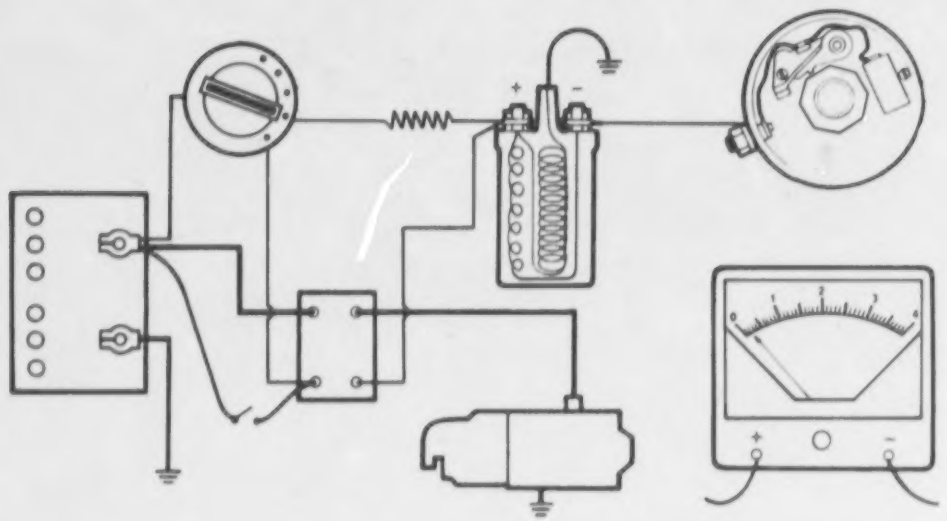
9. The battery voltmeter test results should be approximately _____ volts.

Now turn to the back of this book and check your answers for Exercise 20.

EXERCISE 21

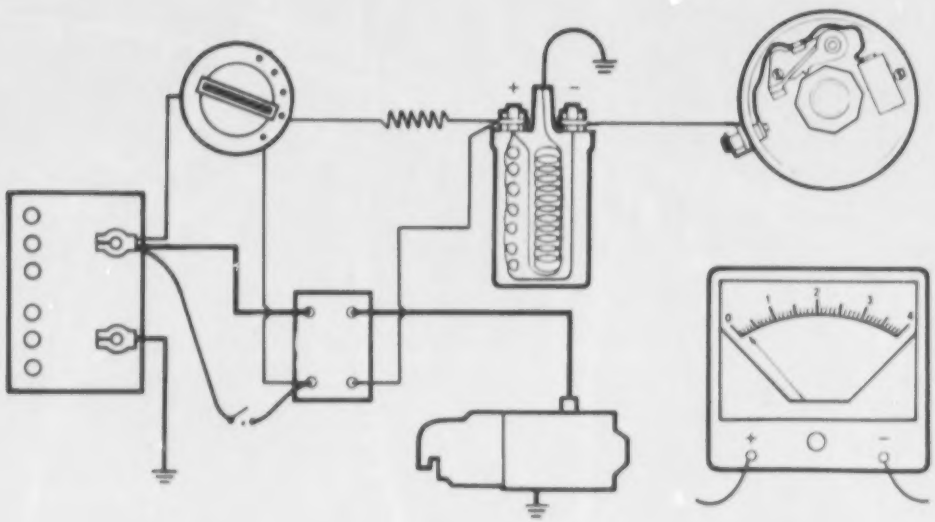
For Questions 1-4, write a *T* in the blank if the statement is true, and an *F* if the statement is false.

1. _____ In a coil-to-ground voltage test of the primary circuit, the contact points are closed.
2. _____ In a coil-to-ground voltage test of the primary circuit, the ignition switch must be in the *run* position.
3. _____ In a coil-to-ground voltage test of the primary circuit, all lights and accessories must be off.
4. _____ In a coil-to-ground voltage test of the primary circuit, it is better to attach the remote starter switch.
5. Look at the diagram below. Draw in the voltmeter test leads to show where to connect them when doing a coil-to-ground voltage test.



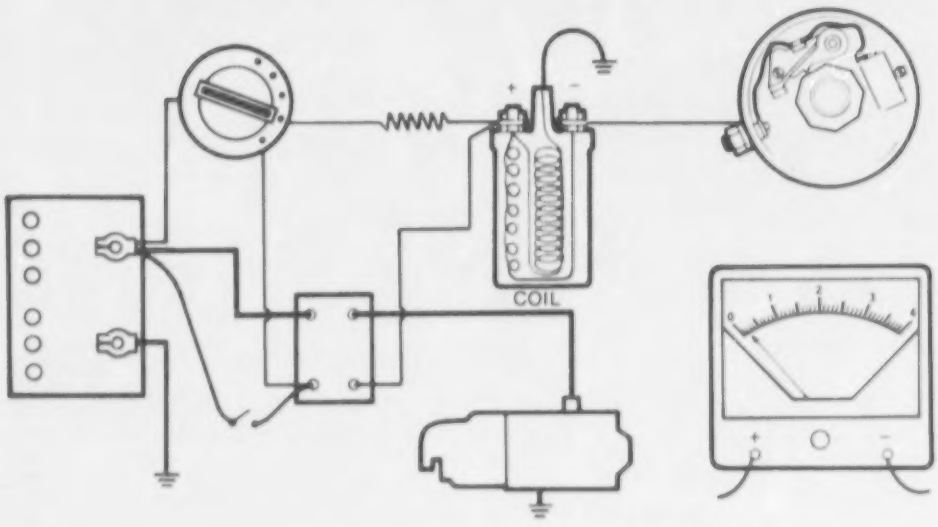
6. If the voltage reading is more than _____ volt, it means there is too much resistance.

7. Look at the diagram below. Draw in the voltmeter test leads to show where to connect them when doing a primary wire high-resistance test.



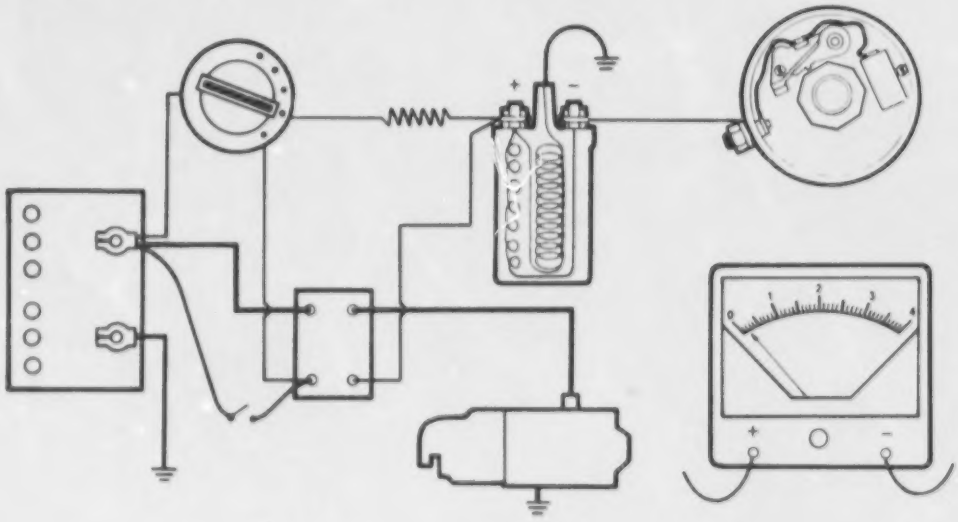
8. If the voltmeter reading drops, the _____ _____ should be replaced.

9. Look at the diagram below. Draw in the voltmeter test leads to show where to connect them when doing a contact point high-resistance test.



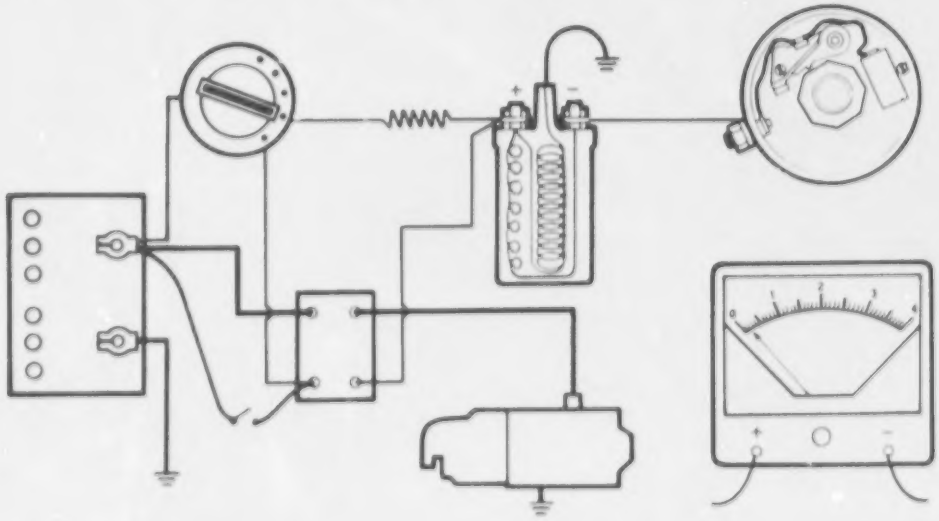
10. If the voltmeter reading drops, the _____ _____ should be replaced.

11. Look at the diagram below. Draw in the voltmeter test leads to show where to connect them when testing the contact point ground wire for high resistance.



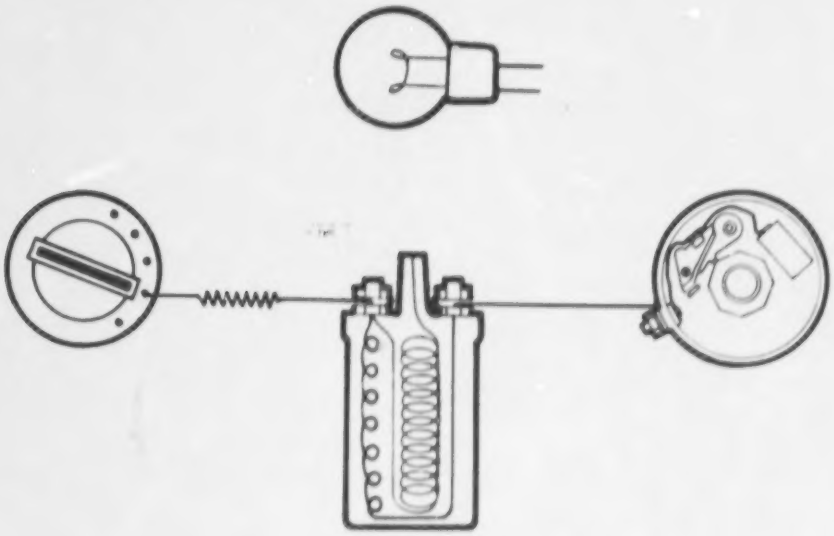
12. If the voltmeter reading drops, the _____ _____ _____ should be tightened or replaced.

13. Look at the diagram below. Draw in the voltmeter test leads to show where to connect them when testing the distributor ground for high resistance.



14. If the voltmeter reading drops, remove the _____ and _____ the base and engine block.

15. Look at the diagram below. Draw in the continuity test light leads to show where to connect them when testing for an *open* primary circuit.



16. The contact points must be _____ when testing for an open primary circuit with a continuity test light.

17. When the tester light lights up, it means that electric current is _____ at the tester.

Now turn to the back of this book and check your answers for Exercise 21.

EXERCISE 22

For Questions 1-8, write a *T* in the blank if the statement is true, and an *F* if the statement is false.

1. _____ The primary start voltage test is done with the ignition switch in ***start*** and the engine cranking.
2. _____ When the ignition switch is in ***start***, the voltage bypasses the resistance wire.
3. _____ A faulty bypass system is one reason an engine may be hard to start.
4. _____ To do a primary start voltage output test, the voltmeter NEG (−) test lead is connected to ground. The POS (+) test lead is connected to the BAT (+) terminal of the coil.
5. _____ If the voltmeter reads within .5 volt of the battery voltage, the primary start circuit is okay.
6. _____ If the voltmeter reads more than .5 volt of the battery voltage, do a primary start circuit resistance test to find the point of high resistance.
7. _____ To do a primary start circuit resistance test, the voltmeter POS (+) test lead is connected to the battery POS (+) terminal. The NEG (−) test lead is connected to the BAT (+) terminal of the coil.
8. _____ If the voltmeter reads less than .5 volt, the primary start circuit is okay.
9. To pinpoint the cause of high resistance in the primary start circuit, move the voltmeter POS (+) test lead to the _____ _____ in the circuit and repeat the test.
10. The maximum allowable circuit resistance is _____ volt at any switch, _____ volt in any lead, and _____ volt at any connection.

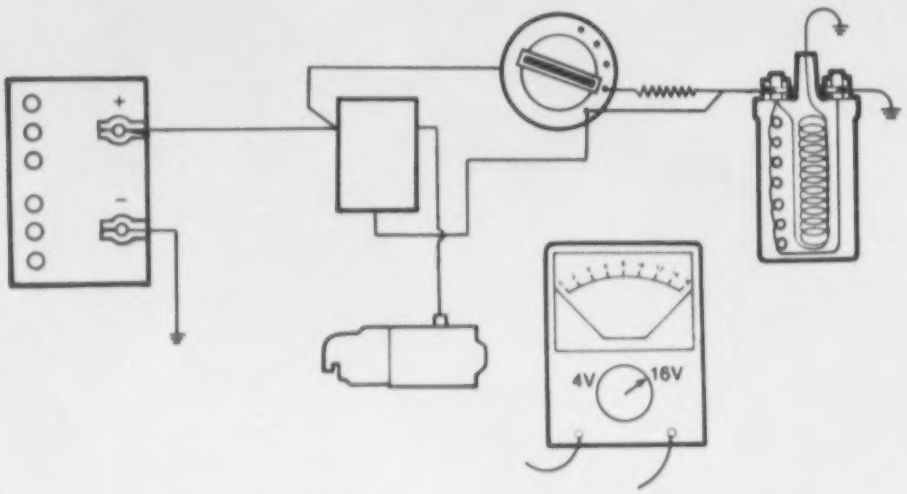
Now turn to the back of this book and check your answers for Exercise 22.

80

EXERCISE 23

For Questions 1-4, write a *T* in the blank if the statement is true, or an *F* if the statement is false.

1. _____ To do a primary run voltage test, the ignition switch must be in the *run* position.
2. _____ A primary run voltage test is a voltage drop test of the primary circuit from the battery to the coil.
3. _____ In a primary run voltage test, the voltmeter POS (+) test lead is connected to the battery POS (+) terminal. The NEG (−) lead is connected to the BAT (+) terminal of the coil.
4. _____ In a primary run voltage test, the distributor primary wire is removed and a jumper wire is connected from the coil DIST terminal to the ground.
5. Look at the diagram below. Draw in the voltmeter test leads to show where to connect them when doing a primary run voltage test.



6. Voltmeter readings should be between _____ and _____ volts to show that the primary ignition run circuit is okay.
7. Too much resistance (high voltmeter readings) indicates that there may be a problem in the

   _____ _____, _____ _____, or _____ _____.
8. You can easily test two parts of an ignition switch while the voltmeter is connected. They are:

   a. _____

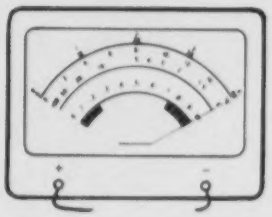
   b. _____
9. The primary resistance wire can be tested with two different testers. They are:

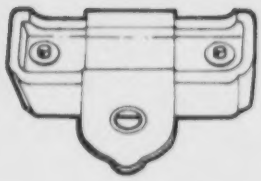
   a. _____

   b. _____

81

10. Look at the illustration below. Draw in the test leads to show where to connect them when doing a ballast resistor test.





Now turn to the back of this book and check your answers for Exercise 23.

82

EXERCISE 24

1. The two main coil primary tests are:

   a. _____

   b. _____

2. The coil _____ test uses an ammeter tester, which measures the amount of _____ flow in the primary ignition circuit.
3. Connect the ammeter test leads so that one is connected to the _____ terminal and the other is connected to the _____.
4. The coil draw test is done with the engine _____ and with the engine _____.
5. Coil draw test specifications are found in _____ _____.
6. Coil resistance tests are made with a/an _____ _____.
7. Both the coil _____ resistance test and the coil _____ resistance test should be made at a room temperature of _____.
8. To do a coil primary resistance test, one test lead is connected to the _____ _____ and the other test lead is connected to the _____ _____.
9. To do a coil secondary resistance test, one test lead is connected to the _____ _____ and the other test lead is connected to the _____ _____.

Now turn to the back of this book and check your answers for Exercise 24.

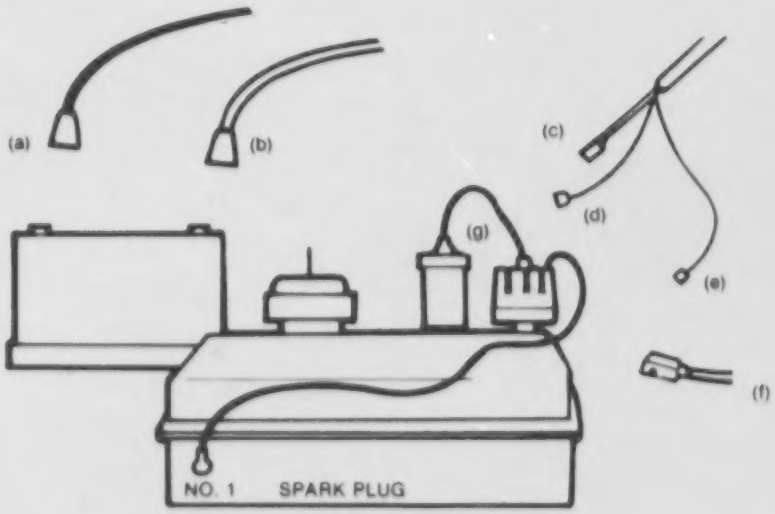
EXERCISE 25

1. The engine oscilloscope is commonly called a _____.
2. The engine oscilloscope is highly sensitive to _____ variations that occur in the _____ system.
3. The voltmeter uses a meter. The scope uses a _____.
4. The scope line is called a _____ or a _____.
5. The waveform is a picture of _____ that occurs in the ignition system during a period of _____.
6. The graduated scales on the scope screen measure voltage in _____.
7. The horizontal movement of the waveform represents _____ measured in _____ of distributor rotation.
8. Dwell scales for _____, _____, and _____ cylinder engines are provided on the scope screen.

For Questions 9-10, write a *T* in the blank if the statement is true, and an *F* if the statement is false.

9. _____ The purpose of preadjusting the scope before using it is to brighten, focus, and align the waveform.
10. _____ Preadjusting the scope changes the shape of the waveform.

11. Look at the illustration below. Draw in the scope leads to show where they connect to the vehicle engine.



*Adapted from the *Sun Engine Performance Handbook. Operating Instructions for the Sun Infra-Red Performance Tester. Model 945/947.* Used with permission of Sun Electric Corporation.

12. Look at the previous illustration. List the points where the scope test leads are connected to the engine.

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

Now turn to the back of this book and check your answers for Exercise 25.

EXERCISE 26

1. Name the three parts of a scope pattern.

   a. _____

   b. _____

   c. _____

2. Using the following line as a baseline, draw a normal secondary pattern.

   0 KV _____

3. Draw vertical lines through the above pattern to divide it into the three major parts of the ignition cycle.

4. The waveform of the ignition cycle shows:

   _____ a. voltage and current
   _____ b. voltage and resistance
   _____ c. voltage and time

5. The amount of voltage that fires a spark across the gap of the spark plug is shown by the:

   _____ a. firing line
   _____ b. spark line
   _____ c. intermediate oscillations

6. The opening of the contact points is shown at:

   _____ a. the end of the dwell section
   _____ b. the beginning of the dwell section
   _____ c. the end of the spark line

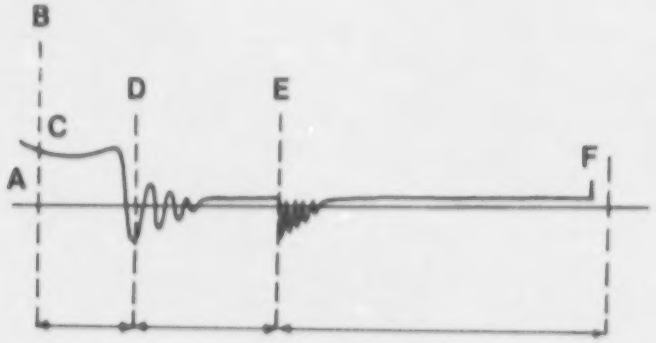
7. What section of the pattern would indicate a faulty condenser?

   _____ a. the firing section
   _____ b. the intermediate section
   _____ c. the dwell section

8. The closing of the contact points is shown at:

   _____ a. the end of the dwell section
   _____ b. the beginning of the dwell section
   _____ c. the end of the spark line

9. Contact point dwell is read in degrees from:



_____ a. the end of the firing section (Point D) to the end of the intermediate section (Point E)
_____ b. the end of the intermediate section (Point E) to the end of the dwell section (Point F)
_____ c. the firing line to the end of the dwell section

10. Poor contact, weak spring tension, and dirty, burned, or misaligned points are shown by the:

_____ a. intermediate section
_____ b. points closing signal
_____ c. points open signal
_____ d. spark line

11. Pitted points or arcing from poor condenser action are shown by the:

_____ a. spark line
_____ b. points open signal
_____ c. firing line
_____ d. points closing signal

12. The superimposed pattern on the scope screen shows the waveforms

_____

13. The display pattern on the scope screen shows the waveforms

_____

14. The raster pattern on the scope screen shows the waveforms

_____

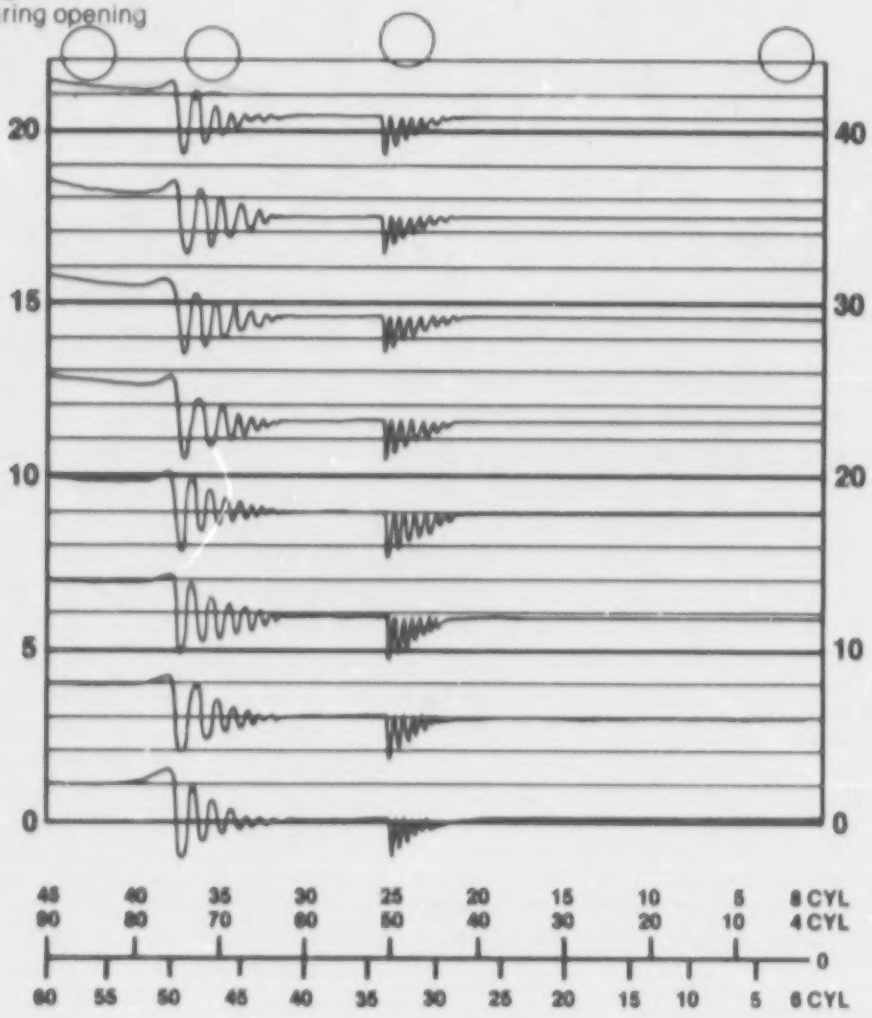
15. The engine firing order is shown on the display pattern, with the firing of the #1 spark plug appearing on the _____ side of the screen.

16. The engine firing order is shown on the raster pattern, with the firing of the #1 spark plug appearing on the _____ of the screen.

Now turn to the back of this book and check your answers for Exercise 26.

EXERCISE 27

1. Fill in each circle with the appropriate letter below to identify the sections of the raster pattern.
   a. coil and condenser
   b. points during closing
   c. spark plugs and wires
   d. points during opening



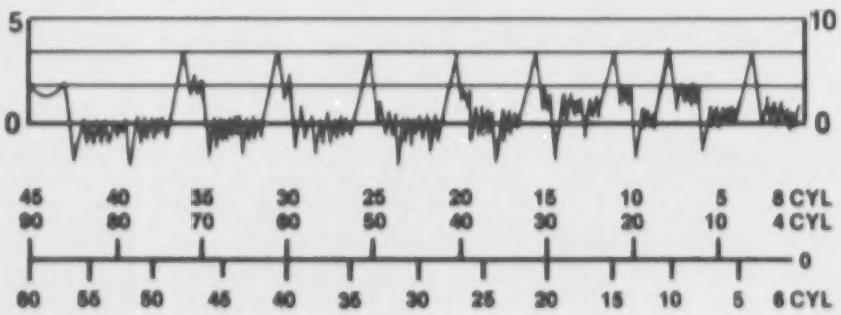
* From the *Equipment Operating Instruction Manual—Tune-Up Training Course*. ©1971 Sun Electric Corporation. Used with permission of Sun Electric Corporation.

For Questions 2-6 below, put a check in the correct box to indicate whether the scope pattern is good or bad.

2. Coil polarity

Good ☐

Bad ☐

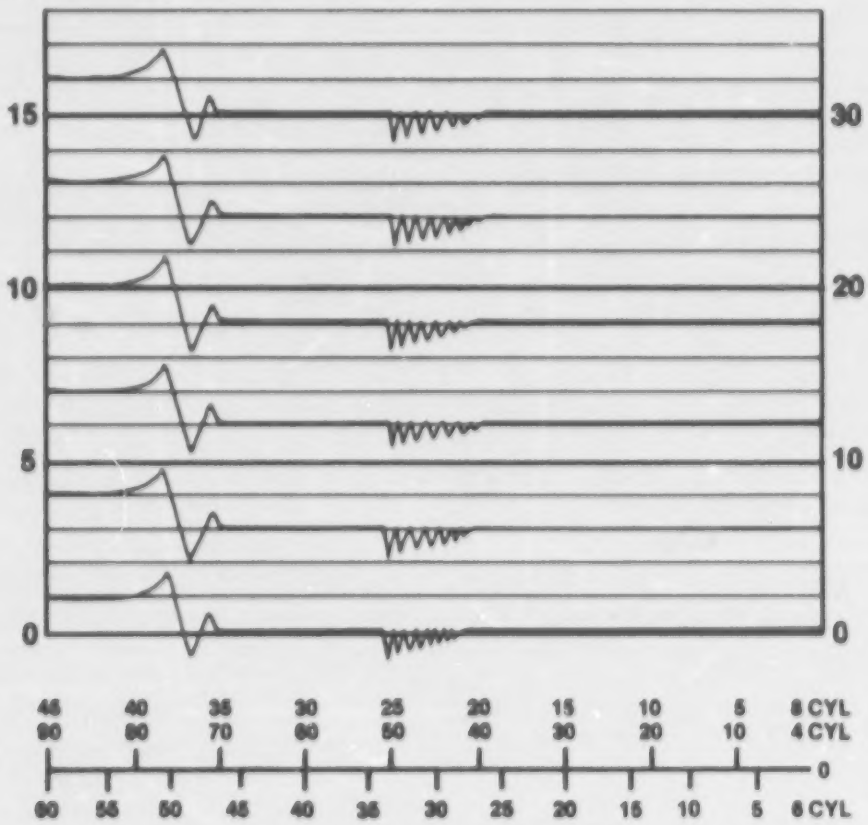


* From the *Equipment Operating Instruction Manual—Tune-Up Training Course*. ©1971 Sun Electric Corporation. Used with permission of Sun Electric Corporation.

3. Coil and condenser condition

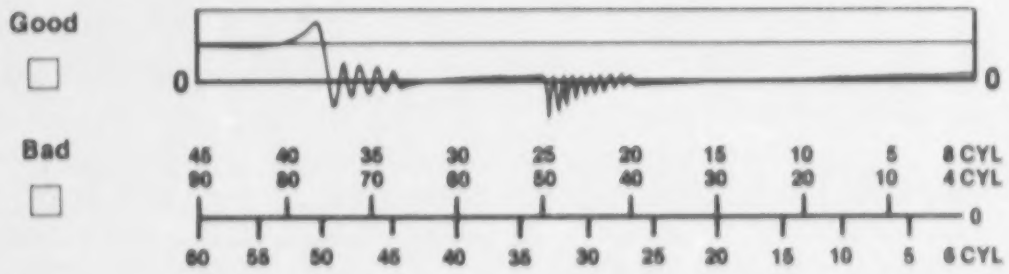
Good ☐

Bad ☐



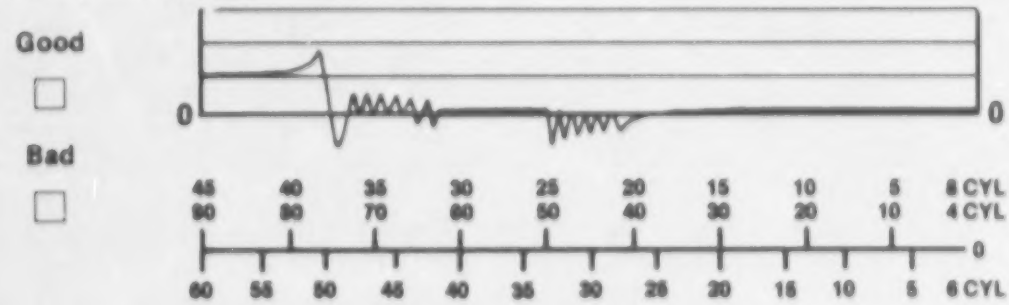
* From the *Equipment Operating Instruction Manual—Tune-Up Training Course*. ©1971 Sun Electric Corporation. Used with permission of Sun Electric Corporation.

4. Contact points closing



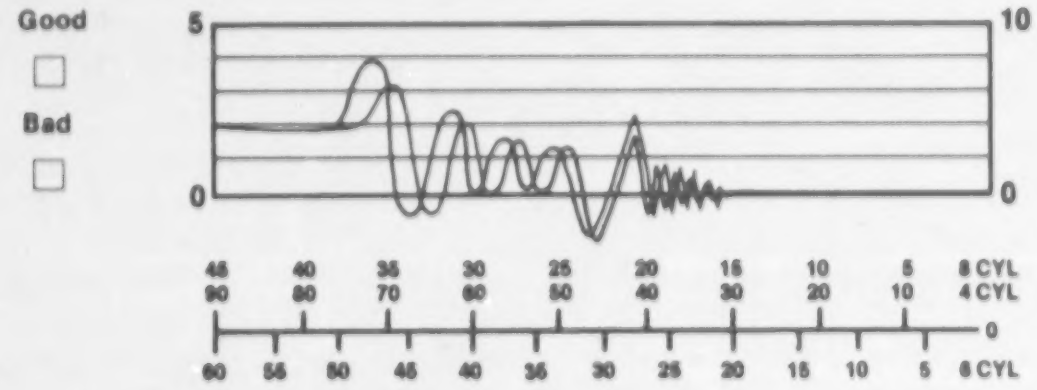
* From the *Equipment Operating Instruction Manual—Tune-Up Training Course*. ©1971 Sun Electric Corporation. Used with permission of Sun Electric Corporation.

5. Contact points opening



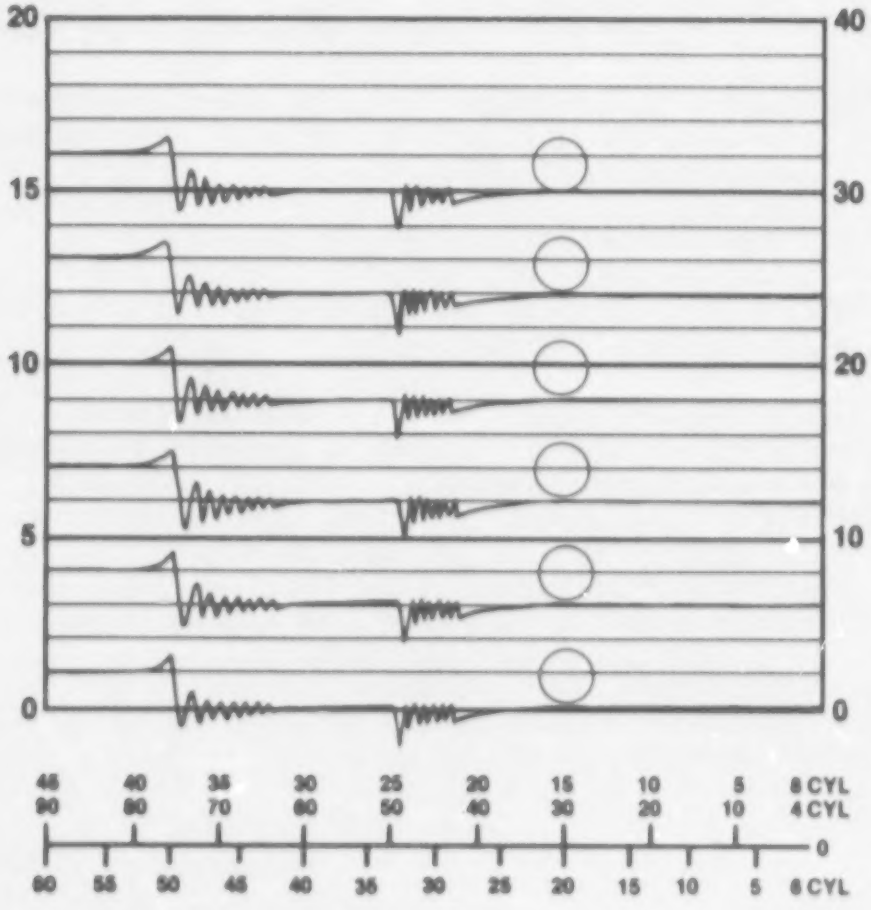
* From the *Equipment Operating Instruction Manual—Tune-Up Training Course*. ©1971 Sun Electric Corporation. Used with permission of Sun Electric Corporation.

6. Cam lobe accuracy



* From the *Equipment Operating Instruction Manual—Tune-Up Training Course*. ©1971 Sun Electric Corporation. Used with permission of Sun Electric Corporation.

7. Fill in each circle with the appropriate number to identify the cylinders on an engine with a 1-5-3-6-2-4 firing order.



* From the *Equipment Operating Instruction Manual—Tune-Up Training Course*. ©1971 Sun Electric Corporation. Used with permission of Sun Electric Corporation.

8. When reading the scope screen for contact point dwell, you should look at the

_____ section of the pattern.

9. When reading the scope screen for dirty, burned, or misaligned points, you should look at the

_____ _____ part of the pattern.

10. When reacing the scope screen for pitted points or arcing at the points, you should look at the

_____ _____ part of the pattern.

11. When reading the scope screen for coil and condenser action, you should look at the

_____ _____ part of the pattern.

12. When reading the scope screen for distributor conditions, you should look at the

_____ _____ and _____

_____ parts of the pattern.

Now turn to the back of this book and check your answers for Exercise 27.

PERFORMANCE CHECKLIST—P.O. 13

The instructor will provide either a live vehicle or a live engine. Test the primary circuit. All of the performances below must be accomplished.

Student Performances

1. Visually checked the spark intensity, primary wiring, and coil polarity.
2. Tested the battery voltage.
3. Tested the primary circuit resistance with a voltmeter.
4. Checked the primary circuit continuity.
5. Checked the contact point dwell and point resistance.
6. Tested the condenser as necessary.
7. Made the appropriate voltage output tests.
8. Tested the ballast resistor.
9. Tested the coil draw and resistance.
10. Hooked up the oscilloscope.
11. Tested the primary circuit with a scope.
12. Reported any malfunctions or necessary repairs.
13. Used the proper tools and equipment.
14. Followed all appropriate safety precautions.
15. Performed tasks in an acceptable amount of time.

Instructor Ratings

Acceptable		Not Acceptable		Omit

Keep a copy of this checklist for your records.

PRETEST—P.O. 14

NAME _____

1. Check all the safety practices listed below that you should follow.

   _____ a. Always rely on your memory when making tester hookups.
   _____ b. Use fender covers when working under the hood.
   _____ c. Connect the coil primary leads according to correct polarity.
   _____ d. Follow the manufacturer's procedures for using test equipment.
   _____ e. Keep long hair under a hat.
   _____ f. Avoid wearing loose clothing or jewelry.
   _____ g. Use correct tools for removing coil primary leads.

2. The coil is usually located:

   _____ a. on the fire wall
   _____ b. on the fender well
   _____ c. on the engine block
   _____ d. on any of the above

3. The mounting position of a coil is:

   _____ a. horizontal
   _____ b. upside down
   _____ c. vertical
   _____ d. any of the above

4. Which of the following terminals on a coil is the same as the NEG (–) terminal?

   _____ a. the DIST terminal
   _____ b. the BAT terminal
   _____ c. the POS terminal
   _____ d. the high-tension terminal

5. The steps for installing a coil are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1	a. Clean the high-tension lead and install it.
_____ 2	b. Place the coil in the bracket; rotate it until the terminals are in the correct position.
_____ 3	
_____ 4	c. Make an operational check of the coil and primary circuit.
_____ 5	d. Install the coil and bracket on the mounting; attach the mounting bolts.
_____ 6	e. Check a technical service manual for correct replacement of the coil.
	f. Connect the primary leads to the coil.

6. Which of the following coil tests would normally *not* be made after installing a coil?

   _____ a. the coil primary resistance test
   _____ b. the coil secondary resistance test
   _____ c. the coil draw test
   _____ d. the spark intensity test at the coil

7. The second part of a coil operational check is to test the primary ignition circuit by:

_____ a. using a scope
_____ b. using an ammeter
_____ c. using a voltmeter and an ohmmeter
_____ d. making a voltage drop test
_____ e. making a continuity test

8. A newly installed coil would not meet the manufacturer's specifications if:

_____ a. the RFI shield was left off the distributor
_____ b. the wrong coil was installed in the vehicle
_____ c. there were problems in the cranking circuit
_____ d. the battery was in poor condition
_____ e. nonresistor wires were installed in the secondary circuit

When you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you to either practice the work activities or to study the material covered by this test.

EXERCISE 28

1. Coils are located in several places in the engine compartment. However, all coils are located near the

   _____.

2. Number the following coil removal procedures in the correct order.

   _____ a. Remove the coil mounting bolts.
   _____ b. Remove the coil high-tension lead.
   _____ c. Remove the coil primary leads from the coil terminals.
   _____ d. Mark one primary lead to identify its coil terminal connection.

3. Why should you mark and identify one coil primary lead when removing it from the coil? _____

   _____

   _____

4. When installing a new coil, be sure the _____ _____ is the one listed in the parts catalog.

5. The coil primary terminals can be identified by their markings, which may be:

   a. _____ or _____

   b. _____ _____ or _____

   c. _____ _____ or _____

Now turn to the back of this book and check your answers for Exercise 28.

PERFORMANCE CHECKLIST—P.O. 14

The instructor will provide either a live vehicle or a live engine. Remove and install the coil of the primary circuit. All of the performances below must be accomplished.

Student Performances

1. Removed and marked the leads to coil.
2. Removed the bracket and coil.
3. Checked the manufacturer's specifications for replacing the coil.
4. Installed the coil, and attached the leads.
5. Tested coil draw and resistance.
6. Tested the primary circuit with a scope.
7. Reported any defects in the coil function.
8. Used the proper tools and equipment.
9. Followed all appropriate safety precautions.
10. Performed tasks in an acceptable amount of time.

Keep a copy of this checklist for your records.

Instructor Ratings

Acceptable	Not Acceptable	Omit

PRETEST—P.O. 15

NAME _____

1. Check all of the safety practices listed below that you should follow.
   - _____ a. When installing the ignition switch, be sure to connect the leads to the proper switch terminals.
   - _____ b. Always disable the ignition when working with ignition switches.
   - _____ c. Avoid wearing loose clothing or jewelry.
   - _____ d. Use clean tools when working inside a vehicle.
   - _____ e. Use a seat cover only if you wear a belt.
   - _____ f. Follow the manufacturer's procedures for using test equipment.

2. Which type of ignition switch has the switch mounted remotely from the lock cylinder?
   - _____ a. the in-dash switch
   - _____ b. the steering-column switch
   - _____ c. both types of switches

3. The steps for removing a steering-column ignition switch are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1	a. Disconnect the ignition switch connector(s).
_____ 2	b. Remove the ignition switch.
_____ 3	c. Remove the ignition switch attaching screws.
_____ 4	d. Remove the column support bracket and bolts.
_____ 5	e. Remove the screws from the cover and seal at the lower end of the steering column.
_____ 6	
_____ 7	f. Lower the steering column so that the steering wheel rests on the seat.
	g. Remove the battery ground cable clamp.

4. The steps for installing an in-dash ignition switch are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1	a. Make an operational check.
_____ 2	b. Tighten the mounting nuts.
_____ 3	c. Connect the battery ground cable clamp.
_____ 4	d. Attach the connector to the ignition switch.
_____ 5	e. Install the lock cylinder.
_____ 6	f. Insert the switch in the dash opening.

5. How can the operation of the ignition switch be checked?

_____ a. by using a scope to check the primary circuit operation
_____ b. by using a voltmeter to check the primary circuit output
_____ c. by using a key to see if the switch is functioning
_____ d. by using an ammeter to check starter draw

6. The actuator rod is also called the:

_____ a. shift lock bracket
_____ b. ignition switch rod
_____ c. lock bolt
_____ d. neutral start rod
_____ e. ignition switch connector

7. Which type of resistor is called an internal resistor?

_____ a. a ballast resistor
_____ b. a wire resistor

8. The ballast resistor is usually located:

_____ a. on or near the distributor
_____ b. on or near the coil
_____ c. on or near the fire wall
_____ d. in the ignition wiring harness
_____ e. on the main fuse block

9. The steps for installing a resistor wire are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1	a. Attach the battery ground cable clamp.
_____ 2	b. Attach the resistor wire lead to the ignition switch connectors.
_____ 3	c. Install the wiring harness.
_____ 4	d. Make sure the resistor meets the manufacturer's specifications.
_____ 5	e. Attach the resistor wire lead to the coil; then attach the other leads.
_____ 6	

When you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you to either practice the work activities or to study the material covered by this test.

EXERCISE 29

1. Briefly state why the following practices are unsafe.
   a. Working near an ignition switch without disconnecting the battery ground cable:

   _____

   _____

   b. Connecting wires to the incorrect terminals on the ignition switch:

   _____

   _____

2. There are two basic types of ignition switches: the _____ type and the _____ _____ type.
3. Always remove the battery _____ cable before removing the ignition switch.
4. To remove the lock cylinder, insert a wire into the small _____ _____ _____.
5. Then, while pushing in on the wire, continue to turn the cylinder in a _____ direction.
6. Remove the ignition switch from the _____ of the dash.
7. When disconnecting the ignition leads from the switch terminals, you should always _____ them to be sure they will be reinstalled on the correct terminals.
8. Ignition switch connectors or leads must always have good _____ connections to the ignition switch.
9. One way to check an ignition switch is to use a _____ to test resistance in both the *on* and *start* positions.

Now turn to the back of this book and check your answers for Exercise 29.

EXERCISE 30

1. The steering-column ignition switch is located on the _____ hand side below the _____ _____.
2. The electrical switching part of the assembly is _____ from the key and lock cylinder.
3. The electric switch is located on the _____.
4. Both the switch cylinder and the electric switch work together by means of a/an _____ _____.
5. Always remove the battery _____ cable before removing the ignition switch.
6. When installing the steering-column ignition switch, it must first be aligned to the _____ _____ with the ignition key turned to the _____ position.
7. Ignition switch connector(s) must have good, _____ connections to the ignition switch.
8. One way to check an ignition switch is to use a _____ to test the resistance in both the *run* and *start* positions.

Now turn to the back of this book and check your answers for Exercise 30.

101

EXERCISE 31

1. There are two types of resistors: the _____ type and the _____ _____ type.
2. Resistors are calibrated by the vehicle manufacturer in _____ resistance values.
3. The external resistor is the _____ type and is generally located on or near the _____.
4. The internal resistor is the _____ type and is part of the engine ignition _____.
5. To make an operational check of a resistor, you should use a/an _____.
6. Generally, to replace the internal resistor, you should replace the engine ignition _____.

Now turn to the back of this book and check your answers for Exercise 31.

PERFORMANCE CHECKLIST—P.O. 15

The instructor will provide either a live vehicle or a shop vehicle. Remove and install the ignition switch and resistor. All of the performances below must be accomplished.

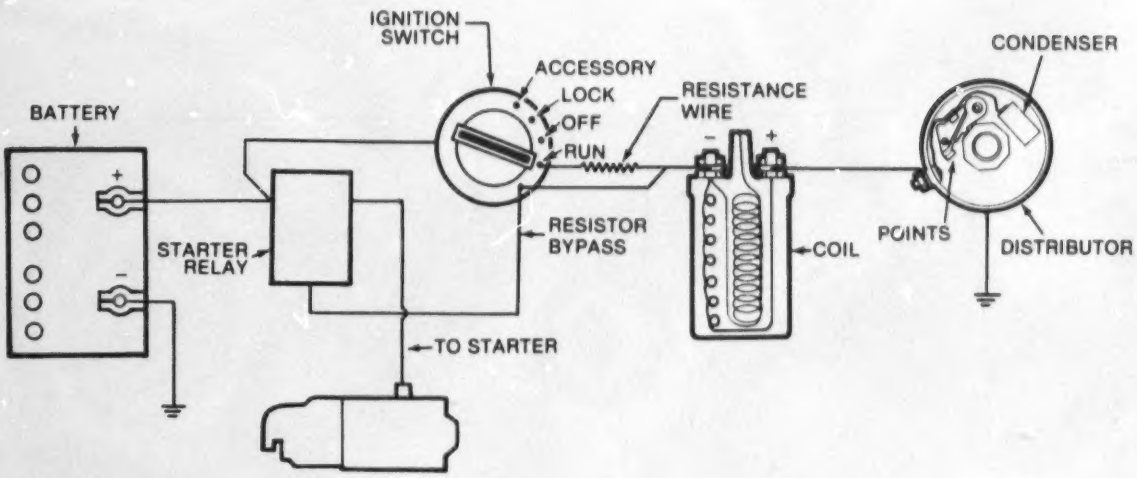
Student Performances	**Instructor Ratings**		
	Acceptable	Not Acceptable	Omit
*1. a. Removed a dash-type ignition switch.			
b. Installed a dash-type ignition switch.			
c. Made an operational check of the switch.			
*2. a. Removed a steering-column ignition switch.			
b. Installed a steering-column ignition switch.			
c. Made an operational check of the switch.			
3. Removed an ignition resistor (wire or ballast).			
4. Tested an ignition resistor.			
5. Installed an ignition resistor.			
6. Made an operational check of an ignition resistor.			
7. Used proper tools and equipment.			
8. Followed all appropriate safety precautions.			
9. Performed tasks in an acceptable amount of time.			

*The instructor may choose to delete this if the performance of both 1 and 2 is felt to be unnecessary.

Keep a copy of this checklist for your records.

ANSWERS TO THE EXERCISES

ANSWERS TO EXERCISE 1

1. primary, secondary
2. 25,000
3. ignition
4. ignition coil
5. low
6. a. T
   b. F
   c. F
   d. F
   e. T
   f. T
   g. T
7. 

8. kilovolts

Now turn to page 5 in your Student Guide.

ANSWERS TO EXERCISE 2

1. b
2. a. screwdriver, 1/2
   b. distributor cap
   c. rotor
3. contact points
4. up, off
5. ear (or tang), groove, press
6. Radio Frequency Interference
7. conventional

Now turn to page 13 in your Student Guide.

ANSWERS TO EXERCISE 3

1. a. distributor
   b. cam
   c. coil
   d. coil-to-distributor lead
   e. condenser
   f. contact points
   g. breaker plate
2. a. movable point
   b. stationary point
   c. rubbing block
   d. base (stationary point)
   e. pivot post
   f. terminal (condenser/coil, lead terminal)
3. a. spring tension
   b. closed, current
   c. cam, rubbing block
   d. current
4. Yes
5. Yes
6. Yes
7. a
8. b
9. a, b, c, d
10. a
11. arcing, burning, pitting
12. early
13. a, b, c, d
14. a, b, c

Now turn to page 18 in your Student Guide

ANSWERS TO EXERCISE 4

1. crank, start
2. voltage drop
3. a, b, c, d
4. b
5. open
6. b
7. touches
8. shorter
9. longer

10. a. closed
    b. movable
    c. the paper falls out
    d. spring tension gauge

Now turn to page 25 in your Student Guide.

ANSWERS TO EXERCISE 5

1. a. absorb, open
   b. holds
2. breaker plate
3. contact points
4. primary coil
5. a, b, c, d
6. fail to operate
7. miss
8. miss
9. a, b, d
10. a. distributor wire
    b. distributor primary wire
    c. distributor housing
    d. open
11. condenser lead, ground circuit
12. insulation
13. size, capacity

Now turn to page 34 in your Student Guide.

ANSWERS TO EXERCISE 6

1. a. distributor, rotor
   b. breaker plate
   c. primary, condenser
   d. stationary
2. a. Clean
   b. cam lubricant
3. a. primary, condenser
   b. breaker plate assembly
4. burn
5. uni-set

Now turn to page 46 in your Student Guide

ANSWERS TO EXERCISE 7

1. a, b, c
2. c
3. replaced
4. closed
5. closed
6. toward
7. away from
8. b
9. open
10. low
11. high
12. the number of degrees of distributor cam rotation that the contact points remain in a closed position
13. b
14. a. negative, coil
    b. distributor housing
    c. 4, 6, 8
    d. scale, specifications
15. c
16. b

Now turn to page 59 in your Student Guide.

ANSWERS TO EXERCISE 8

1. spark plug, mixture, piston, top dead center
2. top dead center
3. tune-up, engine compartment
4. flash
5. ignition timing
6. a. positive battery terminal (red lead)
   b. negative battery terminal (black lead)
   c. #1 spark plug
7. before
8. speed (RPM)
9. a. specifications
   b. timing marks
   c. vacuum
   d. timing light, battery, #1
   e. idle speed
   f. hold-down

g. distributor
h. hold-down

10. advancing
11. b
12. b
13. a
14. a
15. a

Now turn to page 70 in your Student Guide.

ANSWERS TO EXERCISE 9

1. #1
2. #1, #1, timing marks
3. rotor
4. timing
5. T
6. e
7. c

Now turn to page 81 in your Student Guide.

ANSWERS TO EXERCISE 10

1. c
2. a
3. b
4. a. 1
   b. 2
   c. 4
   d. 3
   e. 5
   f. 6
5. They are left off until the dwell and ignition timing are adjusted.

Now turn to page 84 in your Student Guide.

ANSWERS TO EXERCISE 11

1. a. #1
   b. finger
   c. pressures
   d. timing marks

2. a. rotor, #1 spark plug wire
   b. open
   c. hold-down
3. rotor, oil pump

Now turn to page 85 in your Student Guide.

ANSWERS TO EXERCISE 12

1. distributor tester
2. test, adjust
3. a. check the distributor shaft end play
   b. check the distributor shaft for binding
4. distributor tester
5. vacuum advance chamber
6. centered
7. binding
8. a. wash
   b. clamp arms
   c. end play, binding
   d. chuck
   e. chuck, clamp
   f. binding
9. a. Move the distributor shaft back and forth by hand.
   b. Rotate the breaker plate back and forth by hand.
   c. Visually check for signs of wear.
   d. Check the lubrication of the distributor shaft, cam lobes, and breaker plate assembly.
   e. Look for worn, frayed, or oil-soaked electrical leads.
   f. Look for worn, pitted, or burned contact points.
10. a. 3
    b. 8
    c. 3
    d. 5
    e. 2
    f. 6
    g. 1
    h. 7
    i. 4
11. An unprotected rotor turning at high speeds can cause damage or personal injury.
12. Flying pieces of dirt or chips could strike your eyes.
13. Using the proper adapters will keep the distributor from getting damaged.
14. Bottoming the distributor drive gear or shaft into the distributor tester can damage the tester.

Now turn to page 99 in your Student Guide.

110

ANSWERS TO EXERCISE 13

1. a. closed
   b. rotation
   c. movable
   d. spring tension gauge, dwell meter
2. slowly, dwell meter
3. quickly, dwell
4. a, b, c
5. a, b, c
6. b
7. b
8. T
9. T
10. c
11. a. 300, 2,500
    b. runout (or wobble)

Now turn to page 107 in your Student Guide.

ANSWERS TO EXERCISE 14

1. T
2. T
3. T
4. T
5. T
6. T
7. T
8. T
9. T
10. T
11. T
12. decreased
13. increased

Now turn to page 112 in your Student Guide.

ANSWERS TO EXERCISE 15

1. T
2. T
3. T
4. T

5. T
6. a. zero
   b. advance mechanism
   c. closed
   d. 15
   e. clamp
7. a. 200
   b. zero, 20
8. a. 200
   b. arrow
   c. increase, degrees
   d. increase, degrees
   e. vacuum, zero
9. a. retard
   b. same
10. T
11. T
12. T
13. a. remove washers
    b. add washers
14. a. turn allen wrench clockwise
    b. turn allen wrench counterclockwise
15. a. initial or basic
    b. vacuum advance
    c. mechanical advance
16. a. poor acceleration
    b. hard starting
    c. poor fuel economy
    d. "ping" or spark knock

Now turn to page 119 in your Student Guide.

ANSWERS TO EXERCISE 16

1. a. vacuum
   b. initial timing
   c. 2,000
   d. timing marks
   e. advance
2. a. vacuum
   b. initial timing
   c. 2,000
   d. timing marks
   e. advance
3. a. retard side
   b. timing, idle
   c. retard

112

4. F
5. F
6. F
7. F
8. F
9. F

Now turn to page 124 in your Student Guide.

ANSWERS TO EXERCISE 17

1. a. They will damage distributor parts.
   b. It will distort the distributor body and shaft.
   c. It will help the distributor operate more smoothly.
   d. Chips of metal and dirt may get into your eyes.
2. c
3. a
4. a. mechanical advance assembly
   b. breaker plate assembly
   c. distributor shaft and drive gear assembly

Now turn to page 131 in your Student Guide.

ANSWERS TO EXERCISE 18

1. mechanical advance mechanism
2. breaker plate assembly
3. drive gear
4. housing
5. lubricate
6. retainer (or gear pin)
7. lubricate
8. washed (or cleaned)
9. spring retainer
10. peening

Now turn to page 139 in your Student Guide.

ANSWERS TO EXERCISE 19

1. mechanical advance mechanism
2. mechanical advance mechanism
3. drive gear
4. breaker plate
5. lubricate

6. retainer (or gear pin)
7. lubricate
8. freely (or easily)
9. mechanical advance mechanism

Now turn to page 145 in your Student Guide.

ANSWERS TO EXERCISE 20

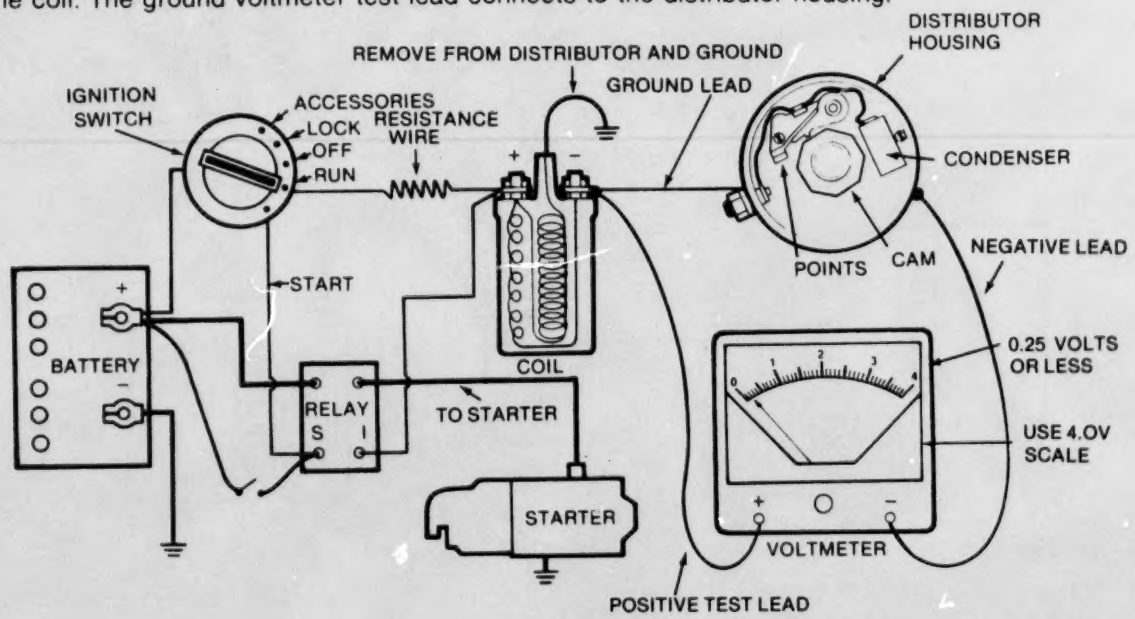
1. a. missing or misfiring
   b. hard starting
   c. loss of power while accelerating
   Others: no starting, rough idle
2. good, weak
3. a. Attach the remote starter switch.
   b. Remove the high-tension coil lead from the distributor cap.
   c. Hold the free end of the high-tension lead about 1/4-inch away from a good engine ground.
   d. Crank the engine and observe the spark.
4. a. loose connections
   b. corroded connections
   c. cut, frayed, or burned wiring
   d. grounding of a bare wire
5. coil polarity
6. (+), POS, or BAT
7. (−), NEG, or DIST
8. a. to make sure the circuit is functioning properly
   b. to locate causes of high (too much) resistance
9. 12 volts

Now turn to page 155 in your Student Guide.

ANSWERS TO EXERCISE 21

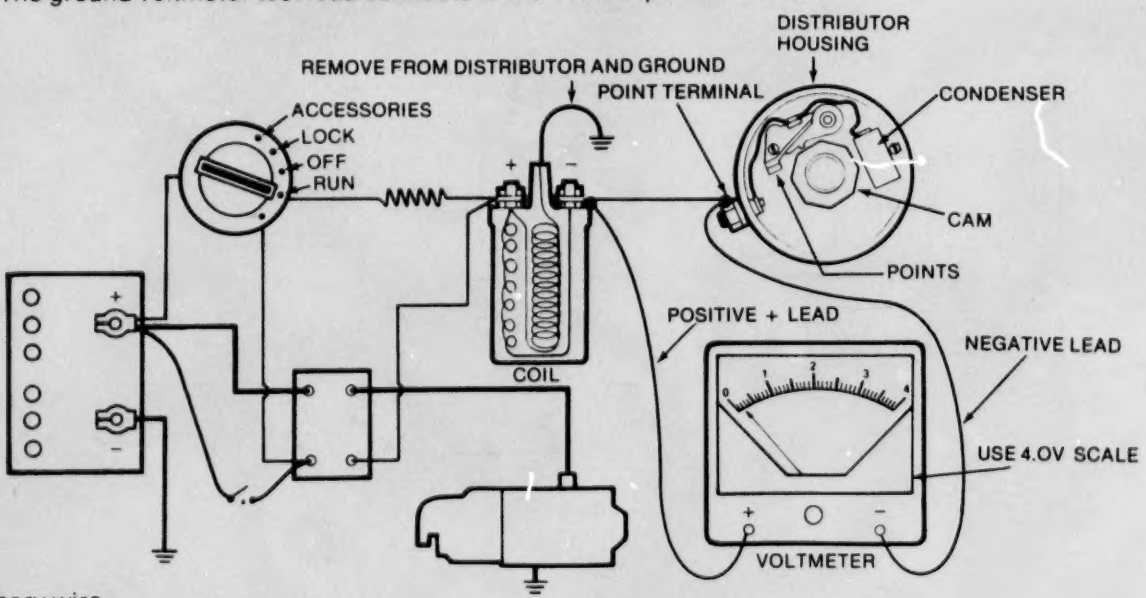
1. T
2. T
3. T
4. T

5. The positive voltmeter test lead connects to the coil primary (–) terminal, on the distributor side of the coil. The ground voltmeter test lead connects to the distributor housing.



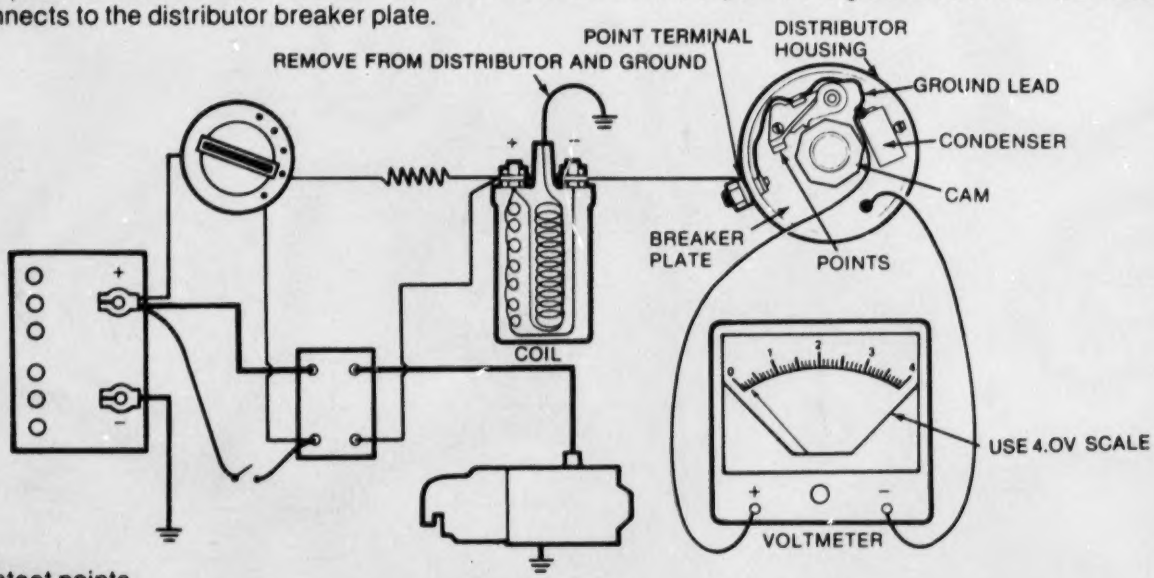
6. .25

7. The positive voltmeter test lead connects to the coil primary (–) terminal on the distributor side of the coil. The ground voltmeter test lead connects to the contact point terminal.



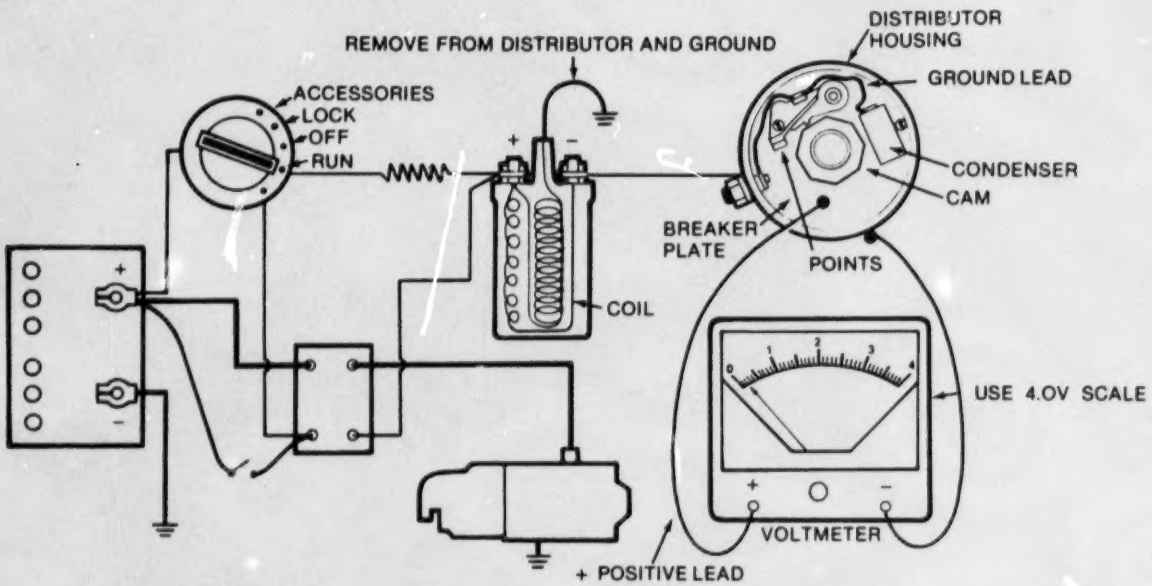
8. primary wire

9. The positive voltmeter test lead connects to the movable contact point. The ground voltmeter test lead connects to the distributor breaker plate.



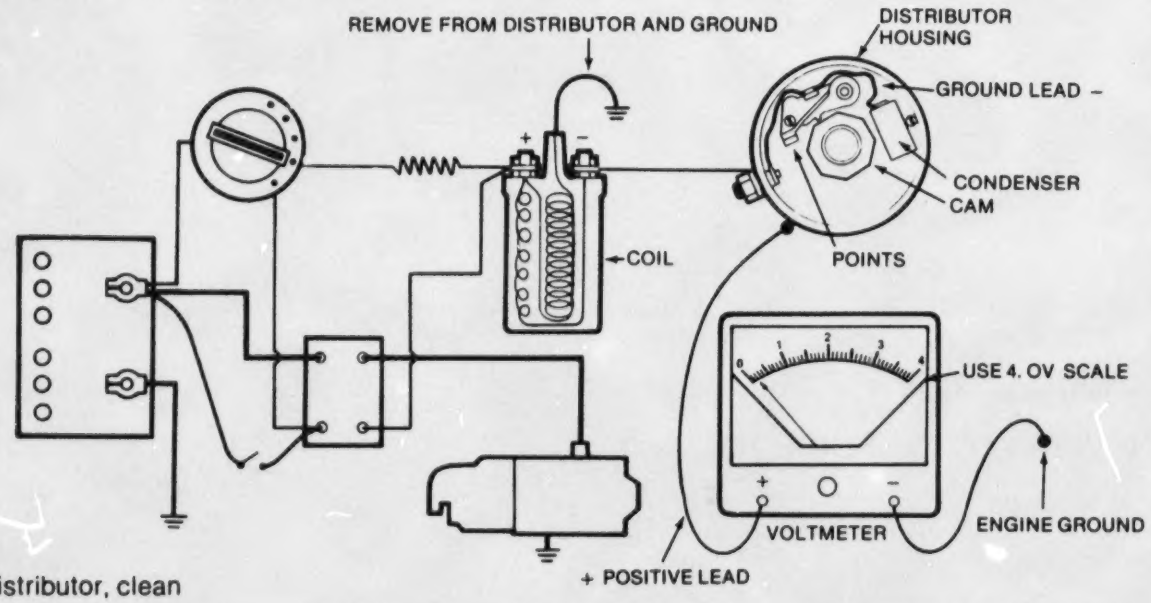
10. contact points

11. The positive voltmeter test lead connects to the distributor breaker plate. The ground voltmeter test lead connects to the distributor housing.



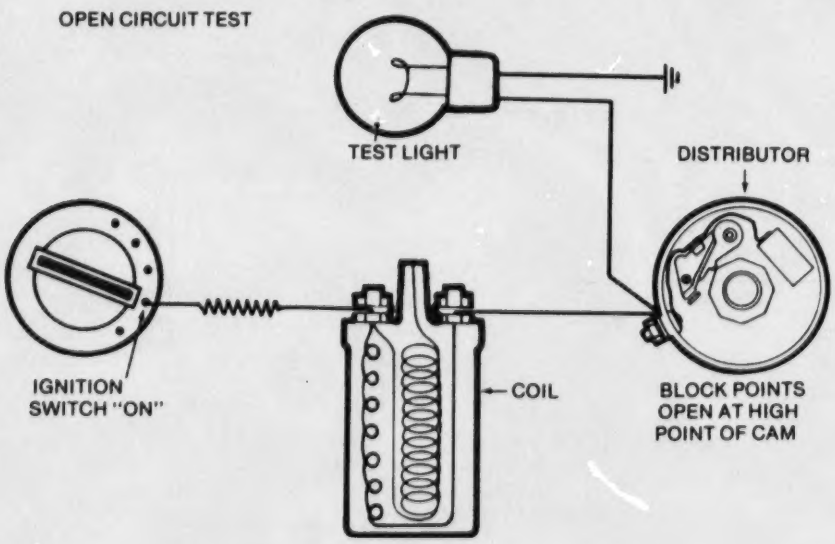
12. contact point ground wire

13. The positive voltmeter test lead connects to the distributor housing. The ground voltmeter test lead connects to a good engine ground.



14. distributor, clean

15. One test lead of the continuity light connects to the distributor primary terminal. The other test lead of the continuity light connects to ground.



16. open

17. flowing

Now turn to page 161 in your Student Guide

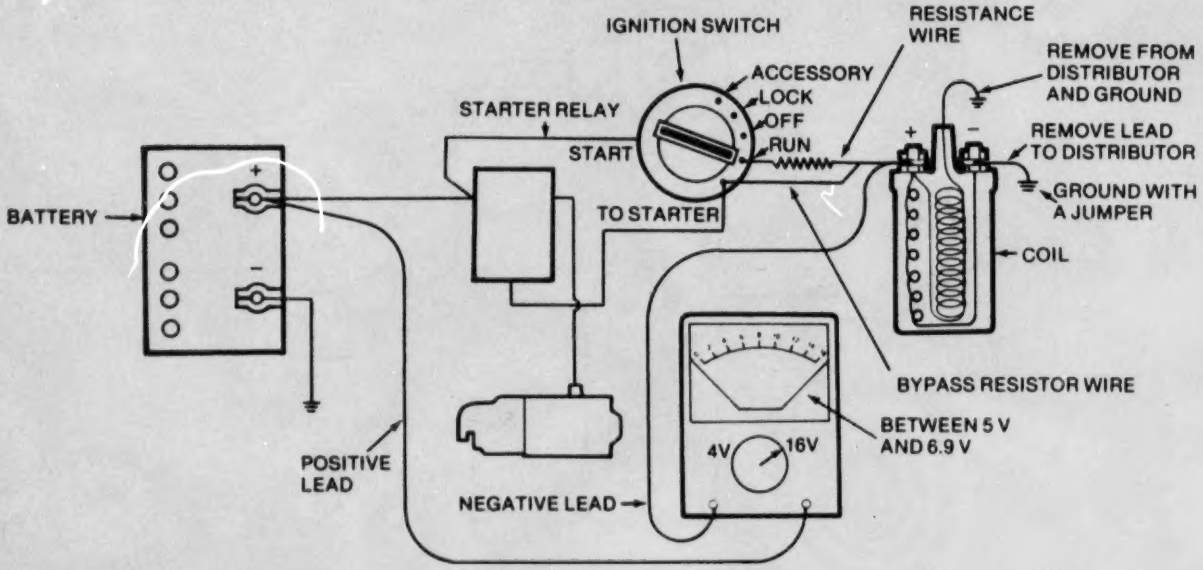
ANSWERS TO EXERCISE 22

1. T
2. T
3. T
4. T
5. T
6. T
7. T
8. T
9. next connection
10. .3, .2, zero

Now turn to page 164 in your Student Guide.

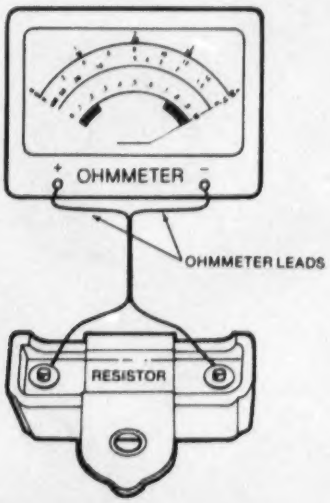
ANSWERS TO EXERCISE 23

1. T
2. T
3. T
4. T
5. The POS (+) voltmeter lead is attached to the POS (+) battery terminal. The NEG (−) voltmeter lead is attached to the BAT (+) terminal on the coil.



6. 5.0, 6.9
7. ignition switch, resistance wire, ballast resistor
8. a. ignition switch contacts
   b. loose connections

9. a. voltmeter
   b. ohmmeter
10. One ohmmeter test lead is connected to the ballast resistor coil wire terminal. The ignition wire attached to the ballast resistor is disconnected. Then, the other ohmmeter test lead is attached to the ballast resistor ignition wire terminal.



Now turn to page 170 in your Student Guide.

ANSWERS TO EXERCISE 24

1. a. coil draw test
   b. coil resistance test
2. draw, current
3. DIST (−), coil-to-distributor lead
4. stopped, idling
5. technical service manuals
6. ohmmeter
7. primary, secondary, 75° F.
8. BAT (+) coil terminal, DIST (−) coil terminal
9. coil primary terminal, coil high-tension tower

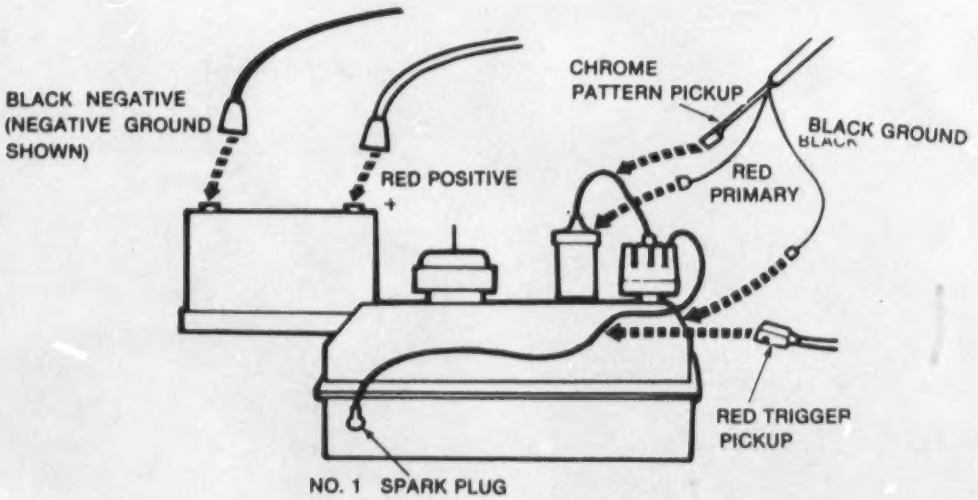
Now turn to page 176 in your Student Guide.

ANSWERS TO EXERCISE 25

1. scope
2. voltage, ignition
3. screen
4. waveform, trace
5. voltage, time
6. kilovolts
7. time, degrees
8. 4, 6, 8

9. T
10. F
11.

CONNECTING THE SCOPE TO THE ENGINE



Adapted from the *Sun Engine Performance Handbook. Operating Instructions for the Sun Infra-Red Performance Tester. Model 945/947.* Used with permission of Sun Electric Corporation.

12. a. Connect the black, negative lead to the NEG (−) battery terminal.
    b. Connect the red, positive lead to the POS (+) battery terminal.
    c. Attach the chrome pattern pickup around the coil high-tension wire.
    d. Connect the red primary tester to the DIST (−) terminal of the coil.
    e. Connect the black primary ground tester lead to ground on the engine block.
    f. Clamp the red trigger pickup around the #1 spark plug wire near the distributor cap.
    g. Disconnect the coil high-tension wire from the distributor cap.

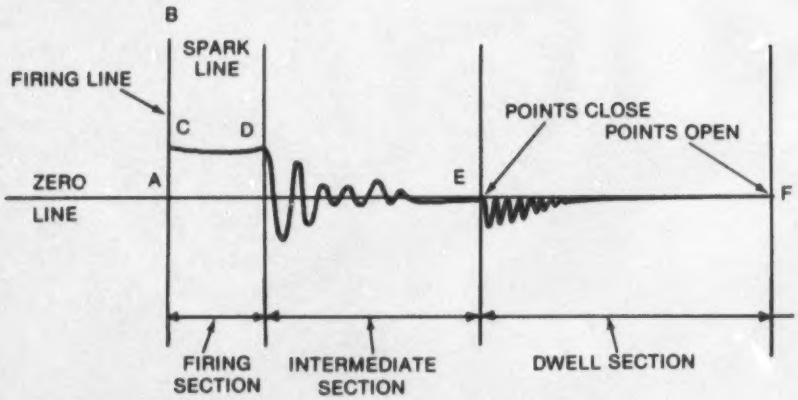
Now turn to page 181 in your Student Guide.

120

ANSWERS TO EXERCISE 26

1. a. firing section
   b. intermediate section
   c. dwell section

2. and 3.



From *A Sun Performance Prover. Model TUT-915-R. Tune-Up Tester. Operating Instructions.* Used with permission of Sun Electric Corporation.

4. c
5. a
6. a
7. b
8. b
9. b
10. b
11. b
12. one on top of the other
13. side by side
14. stacked one above the other
15. right
16. bottom

Now turn to page 188 in your Student Guide.

ANSWERS TO EXERCISE 27

1. c, a, b, d (left to right)
2. Good
3. Bad
4. Bad
5. Bad
6. Good
7. 4, 2, 6, 3, 5, 1 (top to bottom)
8. dwell
9. points closed
10. points open
11. intermediate
12. points closed, points open

Now turn to page 203 in your Student Guide.

ANSWERS TO EXERCISE 28

1. distributor
2. 4, 1, 2, 3
3. Because it must be reinstalled on the same coil terminal to maintain correct ignition polarity.
4. part number
5. DIST or BAT
   POS or NEG
   + or –

Now turn to page 214 in your Student Guide.

ANSWERS TO EXERCISE 29

1. The ignition switch could become damaged if the battery ground cable is not disconnected.
2. It could result in serious damage to electrical parts.
3. dash, steering column
4. ground
5. release pin hole
6. counterclockwise
7. back
8. mark
9. tight
10. voltmeter

Now turn to page 222 in your Student Guide.

122

ANSWERS TO EXERCISE 30

1. right, steering wheel
2. separate
3. lower end of the steering column
4. actuator (switch) rod
5. ground
6. actuating (switch) rod, lock
7. tight
8. voltmeter

Now turn to page 226 in your Student Guide.

ANSWERS TO EXERCISE 31

1. ballast, resistance wire
2. ohms
3. ballast, coil
4. wire, harness
5. ohmmeter
6. harness

Now turn to page 229 in your Student Guide.